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BOTANICAL SERIES VOLUME XIII

FLORA OF PERU

PART I

BY
J. FRANCIS MACBRIDE
ASSISTANT CURATOR OF THE HERBARIUM, DEPARTMENT OF BOTANY

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EDITOR

CHICAGO, U.S.A.
JANUARY 27, 1936

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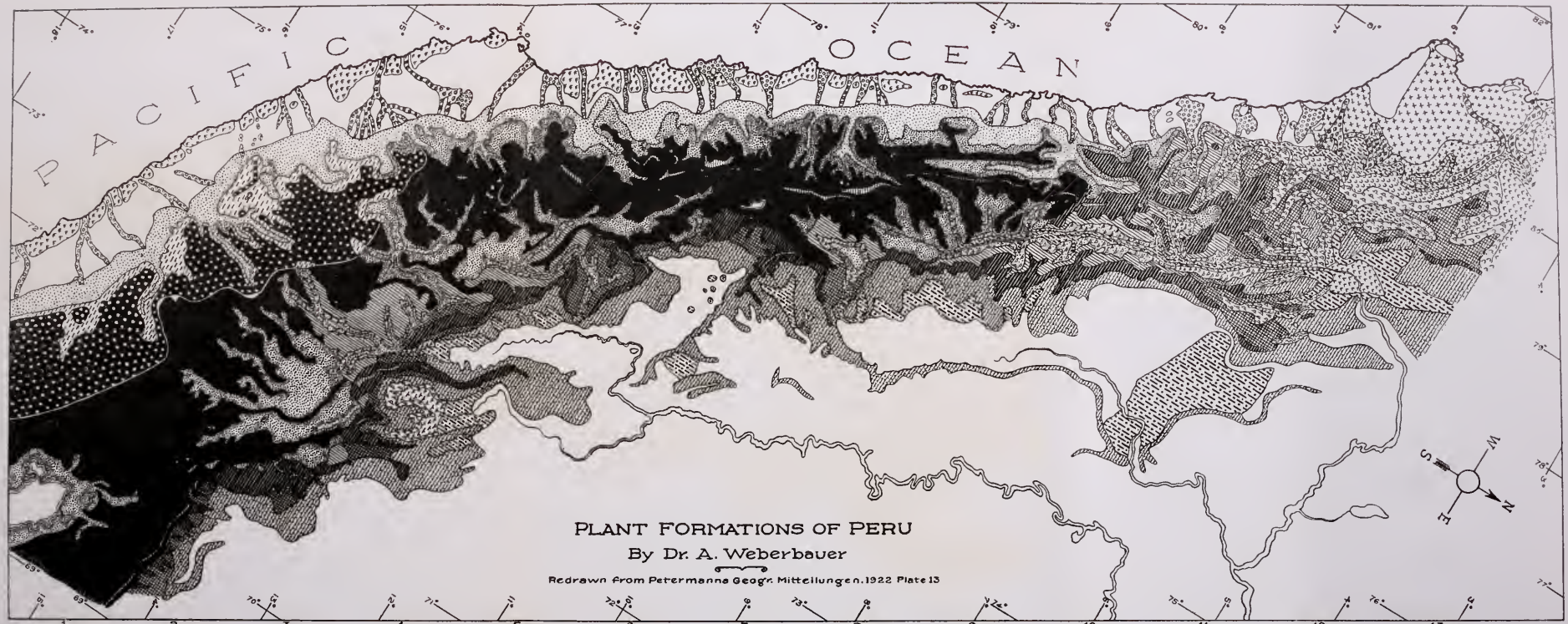
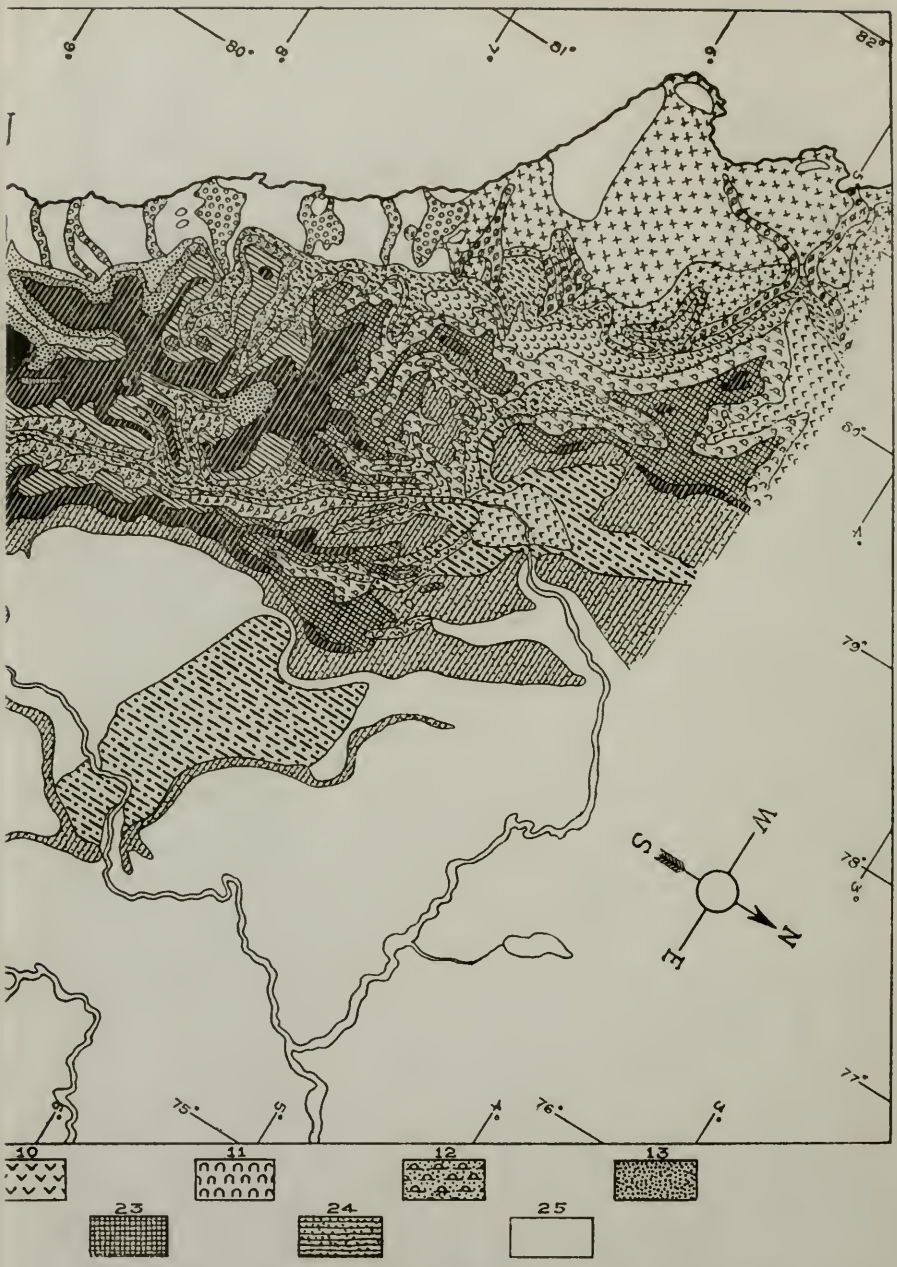


PLANT FORMATIONS OF PERU

By Dr. A. Weberbauer

Redrawn from Petermanns Geogr. Mittellungen. 1922 Plate 13

1. Groves of *Prosopis*, and agricultural areas which replace them.
2. Mixed river bank bushwoods of the coast, including agricultural areas.
3. Desert, no or only isolated plants. (White parts of the map west of Andes.)
4. Lomas of the coast.
5. Distant, evergreen shrubs and very low trees nourished by ground water. Herbs absent, bare soil between the woody plants. Cacti absent.
6. Like (5), but the soil for a short season covered with herbs. Also some rainy-green woody plants besides evergreen ones. Cacti rare or absent.
7. Open xerophytic vegetation of cacti, rainy-green shrubs, etc. No trees.
8. Like (7), but with small rainy-green trees (*Bombax*, etc.) and more grass.
9. Savannas; macrothermal rainy-green grass steppes with scattered rainy-green trees and shrubs. Cacti scarce or absent.
10. Macrothermal rainy-green wood formations (bushwoods or shrubwoods) alternating with rainy-green grass steppes. Cacti frequent in the wood formations.
11. Wood formations like (10), but very little or not at all interrupted by grass steppe. Cacti frequent.
12. Rainy-green wood formations (mostly shrubwoods), transitional between macrothermal and mesothermal vegetation, often with much grass and in places alternating with rainy-green grass steppe. Cacti scarce or absent.
13. Mesothermal rainy-green grass steppes with scattered (mostly rainy-green or periodic) shrubs. Cacti (at least columnar ones) absent.
14. Mesothermal tola heath, characterized by *Lepidophyllum quadrangulare*. Or same formation alternating with other mesothermal-subxerophytic formation.
15. Microthermal tola heath alternating with typical high Andean formations. *Lepidophyllum quadrangulare* predominant below, *L. rigidum* in highest parts.
16. Typical high Andean formations. Many cushion- and rosette-shaped plants. Some procumbent dwarf shrubs. Erect shrubs rare or absent.
17. Microthermal grass steppe, evergreen or nearly so. Shrubs rare or absent.
18. Glaciers and permanent snow.
19. Mesothermal formations, transitional between (13) and (23). Rainy-green grass steppe with a great many scattered shrubs or open shrubwood mixed with grasses. Several shrubs evergreen, other ones rainy-green. Cacti absent.
20. Formations similar to (19), but belonging to lower parts; floristically different, woody plants more vigorous. Wood formations transitional between mesothermal and macrothermal, partly evergreen, partly rainy-green often with much grass or alternating with rainy-green grass steppe. Cacti few or absent.
21. Macrothermal subxerophytic evergreen bushwoods (consisting of high shrubs and low trees), alternating with evergreen grass steppes.
22. Bushwoods like (21), but uninterrupted by grass steppe or nearly so.
23. Evergreen woods of foggy region, alternating with grass steppes.
24. Evergreen woods of foggy region, unbroken by grass steppe or nearly so.
25. Tropical rain forest. (White portions of the map east of the Andes.)



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Oroya, San José, Tarma, and Huánuco. At the end of six months in the field, the party concluded its work for the year and returned with a collection including about 7,000 specimens.

The following year Mr. Macbride, accompanied by Dr. G. S. Bryan, of the University of Wisconsin, resumed collecting at Huánuco at the beginning of April. Specimens were gathered in the vicinity of Huánuco, at such places as La Quinhua, Huariaca, Ambo, Mito, and Cani, at altitudes of from 8,000 to 15,000 feet. From Huánuco they crossed the eastern Cordillera of the Andes, proceeding to Pozuzo, situated at an elevation of 2,200 feet. From Pozuzo several excursions were made which resulted in the securing of 1,500 specimens of flowering plants and 500 cryptogams. Collecting was afterward continued until the beginning of September at La Merced, where Carlos Schunke, an old resident of that locality, gave valuable assistance. On his return to the coast, Mr. Macbride spent several days botanizing in the hills about Lima in the company of Dr. A. Weberbauer, the well-known German botanist residing there. As a result of this expedition about 11,000 specimens were obtained, of which 750 were cryptogams.

In 1924 no Peruvian expedition was sent out from the Museum, but arrangements were made with Dr. Weberbauer for collecting in the Province of Moquehua and the Department of Tarma in February and March of 1925. During the six weeks spent in the field a collection was gathered, represented by more than one thousand specimens.

In addition, the Museum obtained a series of plants collected in 1925 in Peru and Chile by Dr. F. W. Pennell under the joint auspices of the Academy of Natural Sciences of Philadelphia, the Gray Herbarium of Harvard University, Professor Oakes Ames (for the Ames Botanical Laboratory), and Field Museum of Natural History. During several months spent in Peru, Dr. Pennell collected in the regions of Arequipa and Cuzco in southern Peru and in the vicinity of Canta, northeast of Lima. Dr. Pennell's work in Peru, Chile, and Bolivia yielded 1,711 specimens to the Herbarium, the majority of which were Peruvian.

From January to March, 1926, Dr. Weberbauer visited the departments of Ayacucho and Huancavelica in southern Peru in the interest of Field Museum, obtaining 135 numbers, mostly in duplicates of four each. In 1927 arrangements again were made with him for collecting, this time in the coastal departments of Tumbes and Piura in northwestern Peru. The material assembled there during

February and March amounted to 587 specimens. In the same year 700 specimens collected by Carlos Schunke in the vicinity of La Merced were purchased.

In 1928, Professor Fortunato L. Herrera of Cuzco, a well-known student of the Peruvian flora, presented 126 specimens from the wet tropical mountains of southern Peru, and Oscar Haught of Negritos, Piura, donated forty-four plants from the arid coastal region of that locality.

In February and March, 1929, Dr. Weberbauer spent more than a month in the field under the auspices of Field Museum, concentrating his attention on the southern province of Cuzco. He collected particularly in the region of Marcapata, and the majority of his plants, numbering 888 specimens, were gathered at high altitudes.

In 1929–30, Mr. Llewelyn Williams, Assistant Curator of Economic Botany on the Museum staff, spent twelve months in northeastern Peru. With headquarters at Iquitos, numerous excursions were made along the Peruvian tributaries of the Amazon as far as the Brazilian frontier. After spending several months in the lowlands of Loreto, he continued his explorations and collections in the forest extending to the highlands of the eastern Cordillera of the Andes. Mr. Williams returned to Chicago in May, 1930, with a collection of 8,200 numbers, 22,500 specimens in all, in addition to 2,154 specimens of woods and other material.

In 1930 the Museum received in exchange 3,481 specimens collected by Messrs. Ellsworth P. Killip and A. C. Smith in central and eastern Peru in 1929, on an expedition sent out by the Smithsonian Institution. By purchase from Dr. Weberbauer, there were acquired also 1,686 specimens from various parts of Peru, forming an admirable supplement to the large series of authentic material brought together by him in previous years. There was purchased from G. Klug a collection of 3,100 specimens. This, although gathered in a region visited by the Museum expedition and by that of the Smithsonian Institution, contained numerous species not represented in those collections.

From Carlos Schunke of La Merced 720 specimens were purchased in 1930. These were obtained in the Chanchamayo Valley, a region famous for the exceptionally interesting plants it has yielded.

Other valuable additions to the already extensive collections of Peruvian plants include a contribution by Professor Fortunato L. Herrera of 551 specimens, principally from the Department of Cuzco;

a selected series of 259 specimens presented by Oscar Haught, illustrating the flora of a region little known botanically; and an important collection consisting of 206 specimens gathered by Mr. Sawada and received from Professor R. Kanehira of Fukuoka, Japan. In addition, a large number of Peruvian species represented by fragments of type species and other specimens of historical interest were received in exchange from the Botanical Museum of Berlin-Dahlem.

The Museum Herbarium now contains more than 33,000 sheets of Peruvian plants, which is undoubtedly the most complete representation of the flora of that country in existence.

B. E. DAHLGREN

FLORA OF PERU

J. Francis Macbride

INTRODUCTION

In 1798 the first volume of Ruiz and Pavón's *Flora Peruviana et Chilensis*[1] appeared, and in 1802 Volume III was distributed—the last text of a pioneer work which has become a classic in botanical literature. It listed a few hundred species as compared with about 20,000 names, and probably half as many species, to be accounted for in the flora of Peru as it is known today.

In the past one hundred and thirty years no comprehensive taxonomic work upon the plants of Peru has been published. Martius' *Flora Brasiliensis* refers to half the territory of South America, but for the rest of that continent there are only Reiche's *Flora de Chile*, local lists, and the mass of scattered descriptions to be found in botanical literature. The present compilation of the taxonomic literature relating to the seed plants of Peru is, therefore, in itself a pioneer contribution. It attempts to bring together descriptions of all known Peruvian seed plants and ferns, most of them published during the last century.

Except as the taxonomic relationship of the plants listed has already been determined, no effort has been made at a critical disposition of them. I refer here, as later, only to my own portion of the work; a number of the families are treated originally by contributors according to their own ideas. It soon became evident that an attempt to express an opinion on the merit or lack of merit of every species proposed was impractical if the whole work was to be completed within a reasonable period. Besides, many of the described species are known only from the original specimens. Under the circumstances it is obvious that present knowledge of the flora of Peru is merely introductory, even in the case of families for which recent monographs are available.

Synonyms, therefore, are not as numerous as might be expected and mostly they are merely the result of transfers and name changes. In the case of widely distributed species usually there are listed only the original name, if it has been transferred, and the synonyms based

[1] An excellent bibliography of Peruvian botanical literature as well as a list of botanical collectors in Peru, including Ruiz and Pavón, and their itineraries, has been given by Weberbauer in his *Pflanzenwelt der Peruanischen Anden.*

on Peruvian material. Complete synonymy for such species is available, of course, in the reference works cited. Varieties are usually mentioned casually, and most plants treated are left as they were described, usually as species. As a consequence, the keys are more difficult to follow than they would be if specific lines could be drawn more broadly, and there are even a few examples of one key character serving more than one specific name.

In spite of the obvious difficulty of making keys to imperfectly known species, it has often been possible to key them by frankly disregarding relationship whenever its consideration would result in a less practical key. This collection of data relating to Peruvian plants is intended primarily as an aid to their determination. The monographs cited supply such information as exists regarding relationships. The keys here, therefore, are often "unnatural," and the characters used are ordinarily those easily recognized, commonly described as "superficial."

Whenever practical, however, the monographer's alignment and key characters have been retained, and if any group is satisfactorily treated, to use the trite phrase, the credit belongs to the reference work from which the compilation has been made. In a few families the species in several traditionally accepted genera have been included in one key because the genera have no practical basis. Thus the genera have been maintained without sacrificing the practical advantage of their union.

The descriptions are adapted from the original publication or from the reference work; the citation is to be taken as acknowledgment to the author and to the publication. The principal changes, if any, are in the direction of brevity, and usually information contained in the key is not repeated.

My object being to facilitate the ready determination of Peruvian plants rather than to supply a scientific estimate of their relationship, a simple presentation has been attempted. Species follow one another alphabetically, so that the work is its own index as to the accepted names, and the page number of any given species in the monograph or special reference work, when one exists, is given immediately following the specific citation, thus: *Dieffenbachia Weberbaueri* Engler, Bot. Jahrb. 37: 135. 1905; 57. The final number (57) is the page reference to the monograph containing *Dieffenbachia*, cited at the beginning of the generic or family treatment. Thus any one consulting the latter and wishing to refer to my

source of information for greater detail can readily do so without consultation of another index.

The supposed species relationship, when lost entirely by the arrangement of the key, is indicated by a remark, if it seems important. The citations of illustrations are taken mostly from the *Index Londinensis*. When there has been a choice, the one most generally available in libraries has been selected. The serial number of the Rockefeller Foundation collection of negatives of type specimens, on file in Field Museum, is cited also at the end of the description when a negative existed at the time of publication, but the index to these is of necessity incomplete.

The only other text matters requiring explanation relate to citations of material. My own collections and those made with William Featherstone are cited without the name of a collector. Collections not seen by me are enclosed in parentheses. Most species mentioned by Weberbauer in *Die Pflanzenwelt der Peruanischen Anden* are cross-referenced to that work by citing the Weberbauer collection or, if this is unknown, the name Weberbauer, *not* italicized, followed by the page number, *not* italicized. Thus: Huánuco: Mito, *2037*.—Puno: (*Lechler 2222*).—Junín: La Merced, *Schunke 5021; Weberbauer 8460;* 286. Or (Weberbauer 219).

As far as possible, all collections from the various Marshall Field expeditions have been determined by specialists in their respective families and I have tried to indicate this for Field Museum material and also for specimens listed from other herbaria. Generally Field Museum specimens without special indication have been named by me. Not all specimens that I have seen, however, particularly those not belonging to Field Museum, have been studied by me, and their identity, therefore, has been merely accepted. I have tried to be accurate in listing determinations and in crediting identifications, but I am sure that among the many thousands of sheets concerned I have now and then made mistakes; therefore I hope that those gratuitously made responsible for determinations, or whose names are omitted from important identifications will be indulgent. It is sometimes helpful to know who is responsible for the determination of critical material; consequently, this method of citation has been attempted in spite of occasional lapses.

So much for the mechanical features of the work, so to speak, with one exception—the nomenclature followed. Perhaps this may be described in 1936 as modern. A period of transition in rules of nomenclature is evidently upon us, and I am in sympathy with the

idea of reserving action on important matters requiring interpretation. Names are therefore maintained here that do not accord with present regulations. I have applied the same theory in some instances to names of species, when it has not been a simple question of priority but one involving the matter of types.

There remains for mention the geographic area that the work purports to cover. The boundaries of Peru are partly unsettled but, regardless of this, incidental mention has been made of as many species as possible from adjacent territory of Ecuador, Brazil, and Bolivia, experience indicating that most of these will be found in regions unquestionably Peruvian. They are usually listed under a species to which they would key, not necessarily the most closely related one. It is noteworthy that Andean Ecuador rather than Peru marks the southern limit of many northern species, and the Tacna-Arica boundary the northern limit of most Chilean plants; consequently the overlapping of the floras of Chile and of Andean Ecuador with that of Peru is comparatively slight. According to C. E. Hellmayr, the bird life of Tacna is strikingly Peruvian. Unfortunately northern Peru and Ecuador are the least-known Andean regions, the recent explorations in the former of Weberbauer, financed by Field Museum, having yielded many Ecuadorian species. Mention should be made here of the many Poeppig and Dombey specimens of plants characteristically Chilean that have been given labels reading "Peru." The same thing has happened with many Pavón (?) collections, actually Mexican. Most of these, and similar erroneous references in *Index Kewensis*, are such obvious mistakes that often they have not been mentioned.

Doctor Weberbauer has kindly contributed a comprehensive account of the phytogeography of Peru. No one knows the flora of Peru as he does, in a much broader sense than taxonomically, and no one loves it more, and the wonderful land to which it belongs and to which he has given a large portion of his life. Gratefully I record my indebtedness to the many who have assisted in the preparation of this work, especially my associates at Field Museum, who, by constant encouragement and help, have provided a most-needed inspiration as the extent of the task has grown. Otherwise there is scarcely need of the pleasant and customary acknowledgments in a book which is itself a result of the work of so many botanists, from Linnaeus and his predecessors to Ruiz and Pavón, and on through the years to the present. Every page cites their work; they have written the book, I have merely put it together. Never-

theless, I gladly thank every one who has helped in the latter task, most of all the collaborators and those who have named the plants. Since of the many I can not mention all, I restrict myself to the directors of two European institutions where special facilities have been offered me, and acknowledge with particular thanks the kindness of Professor Diels and Professor Pilger and staff at Berlin-Dahlem, Germany, and of Doctor Briquet and staff at Geneva, Switzerland.

PHYTOGEOGRAPHY OF THE PERUVIAN ANDES

A. WEBERBAUER

After the publication of my *Pflanzenwelt der Peruanischen Anden* (Leipzig, 1911), I continued my travels and botanical researches in Peru. The results thereby accomplished were partly published in descriptions of some regions of the country[1], and, as far as they relate to plant formations, were compiled in a colored vegetation map with accompanying explanations[2], herewith reproduced in black and white.

The results of my observations concerning vegetation and flora I should like to present in a discussion of the Peruvian flora, which will supplement and correct the former one of 1911. I therefore avail myself of the suggestion of my friend, Mr. J. Francis Macbride, to write a phytogeographic chapter for his systematic account of the Peruvian flora.

INTRODUCTION

The Peruvians divide their country into three main divisions: La Costa (coast), La Sierra (mountains), and La Montaña (forest land). The highest region of the Sierra, beyond the limits of agriculture, is called puna, or in the north, jalca. The montaña comprises the lower tropical region of the eastern slopes, with the neighboring lowland. This is sometimes distinguished as the montaña real (the proper montaña) on account of its more strongly developed tropical character, and in the north it is called also by the old name

[1] Pflanzengeographische Studien im südlichen Peru. Bot. Jahrb. 48, Beibl. 107: 27–46. 1912.

Die Vegetationsgliederung des nördlichen Peru um 5° südl. Br. Op. cit. 50, Suppl.: 72–94. 1914.

Die Pflanzendecke Nordperus im Departamento Tumbez und angrenzenden Teilen des Departamento Piura. Op. cit. 63: 29–48. 1930.

[2] Die Vegetationskarte der peruanischen Anden zwischen 5° und 17° S. Petermanns Geographische Mitteilung, 89–91, 120–122, with map. 1922.

Mainas, given to it by the missionaries. The upper region of the eastern slopes is called ceja de la montaña (brow of the forest). This division corresponds more or less to the principal differences of climate, vegetation, and other geographic elements.

Resting on a lowland of tropical latitude, reaching up to regions of snow, exposed to climatic contrasts of the west and east and north and south, the Peruvian Andes present a marvelous variety of vegetation pictures. The vertical distribution of the plant growth is governed by both temperature and humidity, and by the latter more evidently in the west than in the east. On the contrary, the horizontal order depends almost entirely upon rain. Deserts, semi-deserts, grass steppes, and low shrubwoods characterize the dry west; vigorous forest formations the humid east. Yet in the extreme north only the lower regions offer a great difference in the two sides; the higher regions, on the contrary, are similar to one another, partly owing to the lesser height of the mountains, partly because the humidity in the Peruvian Andes increases not only from west to east, but also from south to north. The general distribution of moisture is slightly modified by the winter fogs of the coast, but they occur only near the sea and only in middle and southern Peru. The changes in the vegetation which take place in the direction from south to north are much greater on the Pacific side than on the Atlantic one.

Before I describe the Peruvian vegetation and flora, to avoid repetitions I should like to mention certain examples of plants now widely spread in Peru owing to human influence. Some are plants that surely have been introduced from other countries. *Aloe vera*, which is planted in gardens because of its medicinal properties, has become naturalized in the cactus formations. *Agave americana* serves in the regions of middle elevation for hedges and often grows wild. *Arundo Donax* and *Spartium junceum* grow along rivers in warm and temperate, dry and semi-humid regions. *Ricinus communis*, which demands a warm climate, grows on roadsides and in waste ground. Plants doubtfully native whose area certainly has been enlarged through transport or culture are *Argemone mexicana*, *Opuntia Ficus-indica*, and a tall shrub-like *Opuntia* which has approximately cylindric joints and is closely related to *O. subulata*, if not identical with it. *Argemone mexicana* is common on road borders. *Opuntia Ficus-indica*, which is planted for its edible fruit and cultivated for cochineal, belongs to the cactus formations. The other *Opuntia* is found principally in the center and south between 3,000

and 3,900 meters, and is used for hedges. Its joints, which break easily and have long spines covered with barbed hooks, are carried away by cattle and soon take root.

The following division of Peruvian vegetation and flora is suggested:

THE COAST

1. The coastal region of deserts and lomas.
2. The northern coastal region of deserts and semi-deserts.
3. The northern coastal region of the rainy-green park landscape.

THE WESTERN SLOPES, THE HIGH-ANDEAN REGIONS, AND THE INTER-ANDEAN VALLEYS

4. The western Andes of southern Peru.
5. The western slopes of the Andes between the Río Grande system and the Río Moche.
6. The puna of central and southeastern Peru.
7. The inter-Andean valleys south of the eleventh degree of latitude.
8. The inter-Andean section of the Huallaga Valley.
9. The inter-Andean valley of the Marañón, from its beginning to 6° 30′ S. Lat.
10. The jalca or north Peruvian paramo.
11. The western slopes of the Andes between the Río Moche and the Río Saña.
12. The western slopes and inter-Andean region of the extreme north.

THE EASTERN SLOPES

13. The ceja de la montaña.
14. The montaña.

THE COAST

In southern and middle Peru the coast in the proximity of the ocean is watered by winter and spring fogs (*garúas*) that bring forth the growth of the loma vegetation, while behind lies a desert belt which receives neither the winter fogs nor the summer rains of the mountains. This desert comprises, besides the inner coastal land, the lowest region of the Andes, or belongs to this alone where the coast is very narrow. North of the eighth degree of latitude the loma vegetation is almost entirely missing. With the exception of insignificant fogs, which occasionally appear in a few places close to the ocean, the coast is without precipitation between 8° and 4° 20′, first on its entire breadth and later only on the outer part.

The summer rains of the Andes, whose lower limit drops on the western slopes toward the north, reach the foot of the mountains and then penetrate more and more into the coastal land. As a great exception, in some years summer rains extend over the entire breadth of the coastal land. This happened, for instance, in 1925 and with less copiousness in 1926. More or less at 4° 20′, near where the border of the continent turns toward the northeast and the cool current of the ocean almost completely leaves the coast, the rains reach the sea. In the extreme north of Peru, especially in the Department of Tumbes, the coastal land thus receives annually summer rains.

1. The Coastal Region of Deserts and Lomas

The flora shows decided relationships to the much richer flora of the western slopes, and contains, besides, several types there missing or rare which are conspicuous in northern Chile. Among these are *Pasithea, Tecophilaea, Tetragonia, Palaua, Cristaria, Argylia,* and the Nolanaceae.

The formations belong partly to the periodically vegetating ones, partly to the continuously vegetating ones. The first group is represented by the loma formation, the second by the *Tillandsia* associations, the plant associations of the flat sandy strand, the vegetation of wet sea cliffs, and the river bank bushwood.

A. THE LOMAS FORMATION

The vegetation of the lomas, chiefly a loosely joined carpet of herbs, appears about the middle or end of winter, in the north earlier than in the south, and disappears in summer as soon as the coastal fogs begin to scatter. It does not develop every year on the coast of Ica, nor in the north, between Pativilca and Trujillo. Not only here but everywhere its extent depends greatly on differences in the amount of precipitation. In the driest years the verdure of the lomas covers only the summits and ridges, in the wet ones it extends down to the neighboring plains. The lomas depend on the vicinity of the sea; at increasing distance from it they are confined more and more to the summits and ridges of the hills, and at last they disappear entirely. However, they are missing on the very strand and generally move the more away from it, the more gradually the coastal land rises. One finds them up to about a thousand meters. In the vicinity of the sea the hills generally keep below that altitude. The slopes facing the sea or touched by the predominant southern to western winds become wetter than

the slopes on the opposite side. Owing to this, many ridges bear a luxuriant loma on one side and have on the other a very poor vegetation, chiefly consisting of cacti and Tillandsias. The most favorable conditions for the growth of the lomas are found in such valleys as are open to the sea or windward, and thus catch and retain the fogs.

The loma formation consists mainly of herbs, among which annuals are predominant, but tuber-bearing, bulbous, and rhizomatous plants are also found. Remarkable is the small number of grasses and shrubs. These occur chiefly at higher elevations and even there are generally scattered. In some exceptionally favorable places, especially in the south, the shrubs grow closer together, joined in stands. In the loosely woven fields of plants sufficient room is left for terrestrial lichens and mosses. The cacti sometimes are entirely wanting; they prefer stony and rocky places on dry slopes.

The dense fog of the loma season, which on many days the sunbeams can pierce only for a few hours, places the vegetation under unusual conditions. Only to a small degree is there need for protection against drying of the superficial parts. Succulence of foliage is extremely developed only in rare cases. The infrequent occurrence of thick felted hairiness may be surmised from afar by the pure green color of the vegetation. One is reminded of shade plants or the growth of damp ravines at the sight of begonias, *Adiantum concinnum*, and the lax, long-creeping, thin-leaved stems of *Bowlesia palmata*, *Astrephia chaerophylloides*, *Sicyos gracillimus*, etc. Also, the abundance of fruticose and foliose lichens as well as of bryophytes is due to the high atmospheric moisture. Lichens and bryophytes, together with ferns and Peperomias, form epiphytic associations on the branches of the shrubs.

Though the loma is an important climatic formation, it is not everywhere uniform, but exhibits a division into subformations. Considerable differences exist between the level or slightly sloping sand plains and the hills; furthermore, the distribution of plants on these is influenced by clay soil, stony fields, and rocks. The sand plains dry rapidly and, being at a lower elevation above the sea, receive less moisture from the fog than the hills; therefore, their vegetation is lower, looser, and more xerophytically organized than higher up, and the shrubs appear only in a few, mostly procumbent forms. A considerably larger number of shrubs, and especially erect ones, inhabit the hills. Among the stateliest are

Caesalpinia tinctoria and *Carica candicans*, which attain a height of two to three meters.

After the herbs are dried and the shrubs have lost their foliage, lichens, principally fruticose ones which live on earth, stones, and branches, remain as characteristic constituents of the "summer-aspect;" thus wide stretches are covered by a real lichen formation.

B. THE APERIODIC FORMATIONS

The aspect of these is not essentially influenced by the change of seasons.

Not very particular as to soil conditions and very frugal in respect to water supply are the *Tillandsia* associations. These gray Bromeliaceae are densely covered with water-absorbing scale-like hairs, and cling to the ground by a few adhesive roots. They satisfy their need for water with a small amount of atmospheric moisture. We find them in certain places where no other plants except lichens and a few aerial algae can live—on loose quicksand, clayey soil, and clay walls of precolumbian ruins, stony fields, and rocks. Often the frequency of the Tillandsias increases inland up to a certain limit, and they extend far into the desert belt, which is beyond the lomas. Near the station of Santa Clara, between Lima and Chosica, on the inner border of the lomas, enormous quantities of silver-gray *Tillandsia straminea* cover the sandy-clayey plain. Their stems grow toward the southwest or south-southwest, against the prevailing wind, which carries the moist sea air, and they are associated in belts that cross that direction. As the rear parts continually die, one may say that this plant army slowly advances seaward.[1] Also in other places, as, for instance, above Acari, Chala, Mollendo, and Ilo, the *Tillandsia* associations are characteristic of the inner loma borders and the adjacent parts of the desert.

Flat sandy seashore is often covered by a green lawn of *Distichlis thalassica*, sometimes pure, sometimes mixed with other low plants. The creeping and thickly entwined rhizomes of this grass penetrate deeply into the soil and their roots are found even at a meter's depth, where the sand remains constantly moist. The strand presents a different feature in places where the amount of water in the soil is so plentiful that shrubs like *Salicornia fruticosa*, *Batis maritima*, and *Pluchea chingoyo* prosper. These shrubs grow now scattered, now together in stands.

[1] Correction of my wrong interpretation of *plate Va*, page 147, in *Pflanzenwelt der peruanischen Anden*.

Steep wet sea cliffs, consisting of a conglomerate, are found near Lima, between Chorrillos and Miraflores. While absolutely barren on top, they are overgrown on the lower parts by a thick cover of mosses, *Adiantum concinnum*, *Nasturtium fontanum*, *Samolus Valerandi*, *Herpestis Monnieri*, and other herbs, besides some shrubs and reeds. Seen from afar this vegetation appears as a straight-cut band. It owes its existence to the ground water, which constantly filters from above through the soil. The chalk dissolved in the water is precipitated on the stones, algae, mosses, rootstocks and roots. Thus porous masses of tufa are produced, and increase in volume until they separate and fall on the strand. Similar conditions probably exist on the shore near Supe and in San Nicolás Bay.

Along the rivers, fed by the snow and rain of the higher mountain regions, the constantly moist ground also makes an uninterrupted life possible for plants. Here the mixed river bank bushwood grows. It consists of trees like *Salix chilensis*, *Inga Feuillei*, *Sapindus saponaria*, *Acacia macracantha*, and *Schinus molle;* shrubs (*Rapanea manglillo*, *Cordia rotundifolia*, *Cestrum hediondinum*, *Dunalia campanulata*, *Acnistus aggregatus*, *Baccharis lanceolata*, *Tessaria integrifolia*, *Caesalpinia tinctoria*); climbers with slender stems (the twining *Vigna repens* and *Mikania micrantha*); and tall reeds (*Gynerium sagittatum*, *Phragmites communis*, and the naturalized *Arundo donax*). Where the soil is swampy or standing water gathers, *Typha*, *Jussiaea*, and tall *Equisetum* live.

The coast land of the lomas comprises four districts, which will be described briefly, as follows:

I. Southern District, from Arica to the Rio de Lomas

Except for the interruptions caused by the river valleys, the vegetation of the lomas is continuous. The flora contains a considerable number of species that are wanting in the north, such as the bulbous *Zephyranthes albicans*, several Nolanaceae, and *Palaua* species. The shrubs are associated in stands oftener than is common. The lomas of Atiquipa, near the port of Chala and known since the times of Tafalla, surpass, perhaps, all other lomas of the Peruvian coast in abundance of water and in luxuriant vegetation, but have no unusually copious flora. They are crossed by rivulets where bananas, grapes, and other cultivated plants thrive.

II. Ica District, from Rio de Lomas to Canete

In the greater part of this district loma vegetation is wanting. It is found in only a few places: near the Bahía de San Nicolás;

on the hilly land on both sides of the Río de Ica, between Ocucaje and the sea; and on the Cerro Quemado that rises in the Bahía de la Independencia. Moreover, the vegetation does not develop every year at the places named. The Ica district owes its singularity chiefly to the algarrobo groves, which extend along the Río de Ica and Río Grande as well as their tributaries. All these rivers have little water. The algarrobo groves of Ica remind one of the north Peruvian coast near Piura, and are formed here as well as there by the algarrobo tree, *Prosopis chilensis*, in Ica called *huarango*, in whose shade grows the shrub *Vallesia dichotoma*. Among the shrubs occurring on the borders of these groves are the almost leafless *Bulnesia retama*, a *Capparis* with coriaceous leaves closely related to the northern *Capparis avicennifolia*, and the red-blossomed *Stenolobium arequipense*, called *cahuato*, which reaches its northern limit for the coastal land at the Río Pisco.

III. LIMA DISTRICT, FROM CANETE TO PATIVILCA

The loma vegetation is continuous, interrupted only by the river valleys. *Hymenocallis amancaes*, a beautiful bulbous plant very popular in Lima and also found in the northern district, seems to have near Asia the southern limit of its distribution. In wet winters the hills of the San Lorenzo Islands near Callao also become green.

IV. NORTHERN DISTRICT, FROM PATIVILCA TO TRUJILLO

The loma vegetation is restricted to a few places. I saw it between the Río de la Fortaleza and Gramadal; near Huarmey; seventeen kilometers in a straight line south of the Río de Casma; on the Cerro de Chimbote; and on the Cerro Campana near Trujillo. These lomas do not develop annually and are green only for a short time. Their flora is poor. To it belong, besides a few peculiar types and those of the Lima district, certain more tropical elements that elsewhere are missing in the lomas but occur in the sierra; for instance, *Jatropha macrantha* (southward from Huarmey), *Fourcroya* (Chimbote and Trujillo), and *Cephalocereus* (Trujillo). Outside the lomas, near the rivers and in dry beds, grow certain woody plants which we shall find later as characteristic types of the northern coast—*Prosopis chilensis, Capparis scabrida, C. crotonoides*, and, north of Casma, *C. avicennifolia*. They are dependent on ground water, which they reach with deep-growing roots.

2. THE NORTHERN COASTAL REGION OF DESERTS AND SEMI-DESERTS

The loma vegetation which depends on winter fogs appears only in two places and there only for a short time in some years:

on the hills which rise at Cape Punta de Aguja and on the mountain group named Silla de Paita. This plant growth, whose flora has not yet been explored, is said to develop in August.[1] As a rule, the south does not receive rain anywhere and the north only in the interior. These rains fall in summer, and approach the sea more and more toward the north.

A. THE RAINLESS PART OF THE COAST

The seashore is covered at favorable places by halophyte formations, which resemble those of the central and southern coast. To them belongs a shrub, *Cryptocarpus pyriformis* (*nacupilo*), restricted to the north, which often is the cause of the formation of sand dunes.

Besides, we find vegetation conditions whose description follows. The cacti and in most years also the herbs are missing. Characteristic are evergreen woody plants which reach the ground waters with deep-growing roots, especially the algarrobo tree (*Prosopis chilensis*), which takes the form of a shrub where the water supply is scant, and the shrubs *sapote* (*Capparis scabrida*), *bichayo* (*Capparis avicennifolia*), and *faique* (*Acacia tortuosa*). Their seeds can germinate only in rare and exceptional years that bring rain when there also appear certain herbs whose seeds lie dormant in the soil.

Along the rivers in the south the algarrobo tree, together with other trees and various shrubs, forms a mixed river bank bushwood. On the other hand, in the north of the Department of Lambayeque, as well as in the Department of Piura, the rivers are bordered by broad algarrobo groves in which *Prosopis chilensis* dominates. In its shade, forming underbrush, grows the evergreen shrub *Vallesia dichotoma*, locally called *cuncún*. Outside the river bank formations the vegetation consists of scattered algarrobos, sapotes, bichayos, and faiques, or the land is a desert devoid of plant life. The latter happens where the ground water is wanting or can not be reached, or where the soil is highly saline.

B. THE INNER COASTAL BELT

The inner coastal belt, which the summer rains moisten, is, on the whole, smaller than the rainless part. It has, besides the woody plants just mentioned, a few others, partly rainy-green ones, and

[1] Not in October and November, as I have indicated before (Die Vegetationsgliederung des nördlichen Peru, p. 77).

many herbs which, however, vegetate for only a few weeks and are mostly annuals.

Algarrobo groves border the rivers and resemble those of the rainless coast belt, differing chiefly by having herbs growing in their shade. Outside of this formation, which depends on the rivers, the algarrobo and other woody plants are scattered over fields of herbs.

C. SPECIAL DESCRIPTION OF THE PAITA AND PIURA COUNTRY

This region may serve as an illustration of the prevailing vegetation outside the algarrobo groves. Just as, in exceptional years, summer rains extend down to the sea, so there are years in which the coastal land remains rainless over its entire breadth. Probably the average rain limit lies more or less twenty kilometers east of the town of Piura. West of this line prevail the vegetative conditions described above for the rainless coast belt. In the east scattered woody plants rise from ground clothed with herbaceous vegetation. Coming from the west we meet, besides the woody plants found in the rainless coastal region, first the following shrubs: *Capparis crotonoides, Scutia spicata, Grabowskia boerhaavifolia,* and the decidedly rainy-green *Cordia rotundifolia (overal).* The large number of dead woody plants is most striking. They demonstrate that often the supply of ground water is too scant, or that the roots are unable to grow fast enough to reach it. The herbaceous vegetation is sparse, a mere veil through which the glitter of the sand is seen, and is faintly colored, partly gray, due to the abundance of a hairy *Froelichia.* The herbs develop rapidly and their flowers appear early. This is indispensable, considering the unfavorable climate; called into life as by magic through a shower, the plants are in danger of perishing directly when the burning sunbeams strike them. Most of the herbs, including all the grasses, are annual. Of the latter several genera occur, such as *Eragrostis, Aristida, Bouteloua,* and *Anthephora,* though they do not outnumber the other herbs as to individuals. Tuber-bearing plants are represented by the *yuca de caballo (Proboscidea altheifolia)* and the *yuca del monte (Apodanthera biflora).* Bulbous plants are absent.

It may not be superflous to emphasize that this herbaceous vegetation owes its existence to a few showers, develops under high temperature, and is daily exposed to sunshine, and therefore ecologically as well as floristically differs greatly from the loma vegetation of central and southern Peru, which lives almost continually under a cloudy sky, in a damp, cool, foggy air. Here the hygro-

philous and temperate-Andean species of the lomas are missing, also those related to the Chilean flora. In reference to other formation elements, I may mention that the cacti (columnar *Cereus* species) only very rarely appear, and that Tillandsias are wanting here as well as in the rainless coastal land.

If we go farther inland, we meet on the hills, which form the transition from the coastal plain to the Andes, a savanna-like formation. Here also shrubs and small trees stand scattered over ground covered by herbs. Among the latter the grasses prevail decidedly; they are mostly, perhaps altogether, annual. Besides, one often sees columnar *Cereus* plants. To the trees of this formation belong the rainy-green *Loxopterygium huasango* (*hualtaco*), *Caesalpinia corymbosa* (*charán*), *Bursera graveolens* (*palo santo*), and the evergreen *Capparis scabrida* (which also exists in shrub form) and *C. mollis*. Among the shrubs may be mentioned *Cordia rotundifolia*, *Cercidium praecox*, *Mimosa acantholoba*, and *Pithecolobium excelsum*, all rainy-green. The tops of small hills bear the same rainy-green bushwood that characterizes the lowest region of the western slopes of the Andes and will be described below.

3. The Northern Coastal Region of the Rainy-green Park Landscape

This belt of coastal land belongs chiefly to the Department of Tumbes, and lies north of 4° 20′. As mentioned before, the rains extend from the Andes down to the sea. The frequency and abundance of the rains increase inland as well as along the sea to the northeast, though in some years the precipitation is rather scant.

The most widely distributed vegetation may be called park-like rainy-green formation. It consists of fields of herbs, columnar cacti, and sometimes scattered, sometimes grouped woody plants, partly shrubs and partly trees. At the beginning of the dry season the herbs wither and most woody plants lose their foliage. The rainy-green *Loxopterygium huasango* is the most frequent tree, and one of the first woody plants to put forth new foliage. *Caesalpinia corymbosa* and *Bursera graveolens* are also worth mentioning as common rainy-green trees. To the evergreen trees belong *Capparis scabrida*, *C. mollis*, and *Prosopis chilensis*. As examples of rainy-green shrubs may be named *Coccoloba Ruiziana* (*añalque*), *Mimosa acantholoba* (*serrilla*), *Pithecolobium excelsum* (*quiriguinche*), and *Cordia rotundifolia*. The columnar cacti, represented by *Cereus macrostibas* (*gigante*) and *C. Cartwrightianus* (*cardo*), stand now in groves, now isolated on the herb-grown plains. Among the climbers the rapidly

growing *Luffa operculata* (*jaboncillo*) becomes most conspicuous, and develops so luxuriantly in years of copious rains that it completely covers shrubs and small trees. The herbaceous vegetation consists in many places principally of small annual grasses. Elsewhere grasses grow more scattered, and among them a greater amount of other herbs, chiefly annuals, and of suffruticose plants is visible. The growth period of the herbaceous plants is much shorter than that of the rainy-green woody plants. The epiphytic flowering plants are wanting or are represented at best but sparingly in the inner coast by gray Tillandsias.

In accordance with the rain distribution mentioned above, some floristic differences are perceptible within this formation. *Cereus macrostibas*, the small rainy-green tree *Cercidium praecox* (*cani*), and the evergreen shrubs *Capparis avicennifolia*, *Maytenus orbicularis* (*realengo*), *Scutia spicata*, *Grabowskia boerhavifolia*, *Cryptocarpus pyriformis*, *Galvesia limensis* (*curi*), etc., live entirely or chiefly in the exterior part of the coast, while the rainy-green trees *Geoffroya striata* (*seca*), *Bombax discolor* (*pasayo*), *Cochlospermum* sp. (*polopolo*), *Tecoma* sp. (*guayacán*), etc., and the rainy-green shrubs *Achatocarpus mollis*, *Carica paniculata*, *Bougainvillea peruviana*, and others, belong to the inner part.

There should be mentioned also a few other formations of less extent. Hills rising at the foot of the Andes are covered with the same rainy-green bushwood that on the western slopes occupies the lowest region. Its most important tree is *Bombax discolor*. The algarrobo grove follows the rivers. It is typically developed in the south of the Department of Tumbes, while in the north, on the Río de Tumbes and Río Zarumilla, it includes, besides *Prosopis chilensis*, many other woody plants, such as the tree *Guazuma ulmifolia* (*huásimo*). The deltas of the rivers Tumbes and Zarumilla, as well as the strand lying between them, are dominated by the mangrove formation, consisting of *Rhizophora Mangle*, *Laguncularia racemosa*, and *Avicennia tomentosa*. In the delta of the Río Tumbes this formation reaches its southern limit on the Pacific coast of America.

THE WESTERN SLOPES, THE HIGH ANDEAN REGIONS, AND THE INNER-ANDEAN VALLEYS

Everywhere a contrast is perceptible between the extremely xerophytic formations of lower elevations, which are characterized by columnar cacti and many decidedly rainy-green plants, and the

vegetation of higher regions, whose denser growth and minor or almost absent periodicity are due to a moister climate. Besides, the vegetation changes with the increasing humidity to the north and eastward.

The upper limit of the deserts, which lie on the western slopes below the cactus region and are a continuation of the coastal deserts, becomes lower, as a rule, toward the north. The cactus formations to the north or eastward descend to lower levels. They are treeless in the driest regions. Later scattered small trees appear between the cacti, and at last in the north the cacti grow with rainy-green shrubwoods and bushwoods. Higher up vigorous perennial grasses supply one of the most important elements of the vegetation. Very significant for the western part of southern Peru, besides such grasses, are the subxerophytic, evergreen, ericoid tola shrubs, which often are associated in heathlike formations. Then follows, toward the north and east, a rainy-green grass steppe with isolated, more or less rainy-green shrubs. At last grass steppes of moderate periodicity alternate with evergreen shrubwoods and bushwoods, and in some parts of the north the grass steppe is completely supplanted by those woody formations.

In the uppermost regions, which may be called the high-Andean part of Peru, many species belonging to different families are peculiar in rising little above the surface of the soil. Rosette and cushion-shaped plants are found in the puna mat and other formations, often predominating. Of taller growth and less conspicuous by their species than by their individual number are several perennial grasses. A special vegetation character is imparted to the high-Andean region of the western Cordillera of southern Peru by the heaths of low tola shrubs. The other, and by far the larger part of the high-Andean region of Peru is strikingly poor in woody plants, and these, excepting some procumbent shrubs, are restricted to certain places, especially rocks and stony fields. The result of the distribution of precipitation is perceptible in the periodicity of the vegetation and especially in the proportion of taller grasses. The periodicity, on the whole insignificant, is most conspicuous in the south. For nearly the entire puna of southern and middle Peru the rule holds that the taller grasses grow in separated tufts; nevertheless, on the eastern border of this region they draw together to form a close covering. The same change may be observed in the north; between 9° and 8° of latitude the puna makes place for the jalca, whose characteristic formation is a thick grass steppe. North of 6° 30′

the mountain ranges become so low that at only a few places do they reach into the region of the high-Andean grass steppes, here generally called paramo and corresponding to the jalca.

There remain to be mentioned a few edaphic formations occurring on moist soil. Though of only small extent, they occur frequently in different parts of the country. In the deserts and xerophytic regions the evergreen bushwood of river banks contrasts strongly with its surroundings. In regions whose climate offers moderate temperature and moisture the brook bank mat and the meadow moor are at home. The former is a constantly green, thick, carpet-like lawn consisting of various dwarf herbs. The meadow moor is taller and contains many Gramineae, Cyperaceae, and Juncaceae. Between these two formations there are many intermediate types.

4. THE WESTERN ANDES OF SOUTHERN PERU

This part of the Andes might also be called the zone of *Franseria* and tola shrubs. It comprises the western slopes of the southern Peruvian Andes with the western Cordillera ridge and in the south continues beyond the political boundary of the country into Chile and Bolivia. In the north the limit lies more or less at 14° S. Lat. on the ridge of the western Cordillera. In the lower parts of the western slopes, southern and central Peru meet in the system of the Río Grande, about Nazca. The zone of *Franseria* and tola shrubs is marked not only by climatic and botanical peculiarities about to be described, but also by its orographic features—the wide plateaus, high volcanoes rising from them, and deep, steep-walled canyon valleys.

The general aspect of the vegetation as well as the form of the characteristic species demonstrate that the climate is drier than in the adjacent inter-Andean district and on the western slopes of central Peru. From the foot of the Andes the barren desert reaches up sometimes to 2,000 meters and even higher; again we meet in the higher Andean region, sometimes as low as 4,200 meters, great tracts of bare soil. The columnar cacti (*Cereus*) ascend higher than anywhere else in the Andes of Peru. Low, small-leaved, partly evergreen shrubs take a predominant part in the formations. Often such shrubs join to form stands, either of a single species or mixed. Examples of the former case are *Lepidophyllum quadrangulare*, *Franseria fruticosa*, *Fabiana densa*, and others. The leaves of many species have a resin secretion, protective against dryness, and thus present a viscous, shiny surface (*Franseria*, *Lepidophyllum*, *Fabiana*,

Baccharis, Adesmia, and *Coreopsis*). Much smaller is the number of shrubs whose leaves have a thick covering of hairs (*Balbisia, Malvastrum Rusbyi,* and *Senecio iodopappus*). Among the herbs, the annual ones grow plentifully up to 3,800 meters, sometimes even to 4,100 meters.

With regard to the flora, it must be remarked that many species scarcely cross the northern limit of this zone, and that several genera are represented here by a larger number of species than beyond the northern limits. The close relation of the western part of southern Peru with Chile and Bolivia is indicated by *Fabiana, Lepidophyllum, Adesmia, Verbena aspera, V. juniperina, V. minima,* and *Senecio iodopappus. Cantua buxifolia* grows wild in the higher western slopes of south Peru, probably the original home of this well-known shrub, which has long been cultivated in the upper sierra of Peru for its beautiful flowers and perhaps also for medicinal purposes. The characteristic floral elements are found principally in the plateaus, which are of huge extent and occupy by far the greatest part of the surface. The canyon valleys, on the other hand, resemble floristically the west of central Peru, but are poorer in species. They are better watered and in higher regions perhaps have also a moister climate than the plateaus.

The zone of the *Franseria* and tola shrubs is divided into four regions: (a) the desert region; (b) the herb-poor region of columnar cacti and *Franseria fruticosa;* (c) the mesothermal region of the tola heath; (d) the microthermal region of the tola heath.

A. THE DESERT REGION

For its varied upward extension no satisfactory explanation has been found hitherto. It seems that on the plateaus the upper limit lies on the average at greater elevation than in the valleys. In several places it is at 1,800 to 2,000 meters, below Candarave at 2,600 meters, and in some valleys very low, between 500 and 900 meters.

The evergreen river bank bushwood has a similar composition to that on the coastal land. In dry beds there are scattered shrubs of which the largest is the evergreen *Schinus molle.* Outside of the river banks and the dry beds the soil is generally bare of vegetation. At the lower margin of the desert, to the limit reached by fogs from the sea, dense groups of gray Tillandsias are found here and there.

B. THE HERB-POOR REGION OF COLUMNAR CACTI AND FRANSERIA FRUTICOSA

The upper limit generally lies at 3,400 to 3,600 meters, rarely as high as 3,700 or as low as 3,200 meters.

I. THE PLATEAUS

Columnar *Cereus* species and rainy-green shrubs or half-shrubby plants form an open thicket, in whose gaps appear during the rainy months herbs, mostly annual, and a few tuber-bearing or bulbous plants. As the herbs affect the appearance of the vegetation during only a short time, and as their number of species is much smaller than in the higher regions, this region may be called "herb-poor." Among the columnar cacti the tree-like *Cereus candelaris* five meters high is a most conspicuous object at the lower elevations. Small cacti of the genus *Opuntia* spread over the ground. *Franseria fruticosa* is by far the most frequent shrub, easily distinguished by its light green, pinnate leaves. It often occurs grouped in small stands. Its vertical extension reaches from the margin of the desert up to altitudes which fluctuate between 3,200 and 3,500 meters. Other common shrubs not reaching the lower altitudes are *Kageneckia glutinosa, Adesmia* and *Balbisia* species, *Malvastrum Rusbyi, Verbena juniperina, Fabiana densa, Grindelia peruviana, Diplostephium tacorense, Proustia pungens, Coreopsis fasciculata,* and *Senecio adenophyllus.* The type of leafless shrubs is represented by *Ephedra americana* and *Colletia spinosa.* The *Jatropha* species are restricted to the lower border of the region. In the north *Orthopterygium Huaucui* is frequent from the desert margin up to 2,800 meters.

Local differences due to the stone-poor dry plains, the stony or rocky places, and the dry beds may be observed within the limits of this formation. On the stone-poor dry plains the shrubs remain small and the number of columnar cacti is often greatly reduced. Stony fields and rocks are the preferred habitat of columnar cacti and the large spiny *Puya* tufts which, always green, rise at the tops of prostrate, thick, much-branched stems. The dry beds, where at times of heavy rains the water gathers and flows off, favor the growth of shrubs. These stay green longer here than elsewhere, grow to a larger size, and reach farther downward. Among the most vigorous shrubs of the dry beds are *Schinus molle* and *Stenolobium arequipense.*

II. THE CANYON VALLEYS

While the wide flat valleys differ but little from the plateaus in their vegetation conditions, the narrow, deep canyons, enclosed

between steep walls, show some remarkable peculiarities. To be sure, the columnar cacti, rainy-green shrubs, and short-lived herbs are characteristic formation elements here also, but the flora is richer in species than on the plateaus and has great similarity to that of the central Peruvian west. The woody plants develop more vigorously. The evergreen *Schinus molle* occurs much oftener and sometimes becomes a tree. The genus *Puya* becomes very striking by its larger number of individuals. The gigantic, succulent leaf clusters of the genus *Fourcroya*, which, however, reaches its southern limit in the valley of Cotahuasi, and the tall thick-stemmed shrub *Carica candicans* constitute important elements in the xerophytic vegetation of these valleys, while on the plateaus they are missing. Certain frequent species of the plateaus are represented only by scattered individuals in the valleys or are entirely wanting. On the upper border of the region, besides the annual herbs, bulbous and tuber-bearing plants and perennials with rhizomes become important. On the whole, we may say that the vegetation of the canyons is less xerophytic than that of the plateaus.

C. THE MESOTHERMAL REGION OF THE TOLA HEATH

The upper limit fluctuates between 3,800 and 4,000 meters. Ascending the western slopes of the Andes and entering this region we observe that the rigid columns of the Cerei disappear or grow only at certain places. The stiff tufts of perennial grasses, which are hardly altered by the season, and the evergreen tola shrub, *Lepidophyllum quadrangulare*, are the most remarkable of the new elements that appear. The *Lepidophyllum* shrubs are called *tola* around Arequipa, and *taya* farther north in the Province of Parinacochas. In Chile and Bolivia the name *tola* is used also for other shrubs, which, like *Lepidophyllum*, burn easily in green or even wet condition because of their resin content. The imbricated, scale-like leaves of *Lepidophyllum quadrangulare* remind one of certain Coniferae, and the fragrance of its resin increases the similarity.

Among the shrubs of this region *Lepidophyllum quadrangulare* is by far the most frequent, and the others likewise are small-leaved. We meet here some shrubs which belong also to the former region, but not *Franseria fruticosa* and *Malvastrum Rusbyi*, and only rarely *Balbisia* and *Kageneckia*. Furthermore, there grow *Tetraglochin strictum*, *Baccharis incarum*, *Senecio iodopappus*, and *Chuquiragua rotundifolia*. Among the more frequent tufted grasses are *Stipa ichu* and *Festuca orthophylla*. Some cacti also constitute a remarkable part of the vegetation, among them semiglobose to conical, sparsely

hairy *Opuntia* cushions (for instance, *O. ignescens*), and in some places the columnar stems of *Cereus Celsianus* and its relatives, distinguished by the tuft of long, white or brown-red hairs covering their top. A tall shrub-like *Opuntia* related to *O. subulata,* which has been mentioned already in the introduction, is a common plant of the valleys in this region, and in the upper part of the preceding one.

Although the plant growth on the whole is much denser than in the preceding region, nevertheless it shows everywhere bare spots of soil, for while the water supply is more abundant here than there, it is still scant. The most extensive formations are the tola heath and a grass steppe containing scattered shrubs. Their limits often become vague by gradual transitions.

The tola heath is a shrubwood which consists entirely or preponderantly of *Lepidophyllum quadrangulare.* Frequently it extends continuously over several kilometers. It covers chiefly the plateaus, while in the valleys it is less developed or entirely wanting, and it seems to grow by preference on dry, sterile soil.

In extent, other stands of small-leaved shrubs are far more restricted than the tola heath. Sometimes they consist of a mixture of several of the above-mentioned species, in which *Lepidophyllum* also may take part; sometimes they contain individuals of only one species—for example, *Tetraglochin strictum* or *Baccharis incarum.* Moreover, these shrubwoods belong principally to the plateaus.

The grass steppe with scattered shrubs is found on plateaus and also in some valleys. Its composition is not the same in both cases, especially as regards the shrubs. On the plateaus these are *Lepidophyllum quadrangulare* and the other above-mentioned species. In the valleys, in place of these, there occur many shrubs that recall the flora of central Peru, such as *Mutisia viciaefolia, Barnadesia Dombeyana, Hesperomeles pernettyoides,* and *Monnina crotalarioides.* Often there are vigorous dicotyledonous herbs growing among the grasses.

Besides the two most important formations there may be mentioned two lesser ones that are associated with certain soil conditions: the vegetation of the dry beds, characterized by tall shrubs, often of different species than those existing elsewhere; and the *Polylepis* groves, which prefer stony ground and belong mostly to the following region.

D. THE MICROTHERMAL REGION OF THE TOLA HEATH

One might equally well call this the high-Andean region of the tola heath. It begins between 3,800 and 4,000 meters. Since the

tola heath, so dominant in the landscape, here covers great tracts, occasionally up to 4,500 meters and small patches reach even higher, it seems perhaps proper to unite this and the above-described region, as I did formerly. But since most mesothermal shrubs and also the cultivated plants do not ascend beyond 3,800 to 4,000 meters, and since above 4,000 meters high-Andean plants, principally cushion-shaped ones, constitute a prominent part of the plant growth, and since other high-Andean formations exist close to the tola heath and are connected with it by intermediate types, I consider the proposed division more correct.

With the scale-leaved *Lepidophyllum quadrangulare* is associated *Lepidophyllum rigidum*, easily distinguished by its needle-shaped, spreading leaves. The high-Andean tola heath either contains only one of these species or is a mixture of both. On the whole, *Lepidophyllum quadrangulare* predominates at lower elevations, and *L. rigidum*, which thrives even at 4,900 meters, in the higher ones. Less common than the tola heath are shrub stands of *Tetraglochin strictum*, which always is of very low growth in the high-Andean region.

Other high-Andean formations occurring here will be described later on and merely mentioned now. The high-Andean bunch grass formation consists of vigorous tufts of tall perennial grasses, like the gray-green *Festuca orthophylla*, and contains few or no shrubs. The puna mat is composed of cushion and rosette plants. Erect shrubs are absent. On account of its abundance, great size, and peculiar form, *Azorella yarita*, called *yareta* by the native people, becomes a characteristic element of this formation. Its very convex, hard and resinous cushions rise one meter above the soil, and serve for fuel. The gray-hairy *Merope aretioides* forms convex but smaller cushions, as do also the sparsely hairy Opuntias, like *O. ignescens*. The cushions of *Pycnophyllum* species are flat, like those of *Verbena minima*, a shrub of almost wholly subterranean branches. Puna mat, bunch grass formation, and tola heath are connected by numerous intermediate types. In the *Distichia* moor the convex cushions of *Distichia muscoides* are crowded as a thick, succulent, evergreen plant covering. Species of *Polylepis*, which develop into shrubs or small trees as much as five meters high, in some places form *Polylepis* groves.

In the highest part of the microthermal region the vegetation becomes poor, and at last one reaches the cold desert, where the vegetation is wanting or confined to a few places, such as rocks

and stone fields. In the proximity of the western slopes the microthermal region has a rather dry climate. On this account the limit of the cold desert lies comparatively low; even at 4,300 meters bare soil is of much greater extent than that covered by vegetation. Farther inland where the climate is moister and the vegetation extends higher up, the cold desert begins generally between 4,600 and 4,800 meters.

The high-Andean region of the tola heaths is a special kind of puna which I shall describe later. It differs from the common puna of Peru especially by the wide *Lepidophyllum* heaths, and by the greater abundance of convex cushion plants.

5. The Western Slopes of the Andes Between the Rio Grande System and the Rio Moche

Certain essential features of the distribution of the vegetation which I have observed in the south are noticeable here also. Below, above the desert, the vegetation is dominated by columnar cacti, accompanied by other evergreen xerophytes and by strictly seasonal plants—shrubs and herbs—whose green organs function only for a short time; at higher altitudes vigorous perennial grasses are important elements of the main formation, and the periodicity is less pronounced. However, because of their less arid climate, the western slopes of the Andes of central Peru have a richer and more equalized flora, which makes it difficult to distinguish the regions. Between the cactus and grass belts there is an intermediate zone into which there penetrate from below isolated columnar cacti, and from above isolated perennial grasses. Nevertheless, within this intermediate zone there is evident a limit between the two regions, which in the greater part of central Peru lies between 2,800 and 3,000 meters, and perhaps coincides with the frost limit.

Up to this elevation there ascend some of the larger woody plants of the coastal flora: *Schinus molle, Carica candicans,* and sometimes *Caesalpinia tinctoria.* To about the same altitude ascend *Heliotropium peruvianum, Jungia spectabilis, Mentzelia cordifolia,* the genera *Stenolobium, Fourcroya, Croton, Lantana, Cereus,* and other plants that characterize the lower part of the western slopes. On the other hand, from above, *Valeriana, Calceolaria, Berberis, Vicia, Lupinus, Lathyrus, Trifolium, Ribes, Thalictrum, Anemone, Fuchsia, Bomarea,* and others do not cross this divisional line, or only in very reduced numbers as to species and individuals. Some of them do appear once more beyond the desert on the lomas of the coastal land.

Because of the increasing humidity northward, the limit of both regions lies higher at the southern border of central Peru and at the northern lower than is usual. Thus above Pisco the columnar *Cereus* species are still frequent at 3,200 meters, while above Trujillo they are scarce above 1,800 meters.

Within this general distribution of vegetation we observe differences which depend on the humidity of the soil. The river banks at lower elevations are covered by evergreen bushwood that contrasts strongly with the surrounding vegetation, especially during the dry season. Such a pronounced contrast is absent at greater elevations, though it can not be denied that there also is the moist ground of the river and brook banks often favorable to the growth of woody plants.

In accordance with the foregoing observations, three vegetation regions may be distinguished on the western Andean slopes of central Peru: (a) the desert region; (b) the herb-poor region of columnar cacti; (c) the region of the grass steppe with scattered shrubs.

A. THE DESERT REGION

This is, as in the south, a continuation of the deserts on the inner coastal land; the upward extension here also fluctuates greatly in correspondence with different local conditions whose influence is not yet understood. Probably it reaches nowhere higher than 1,400 meters, and at places only to 900 meters. Besides the river banks, where the evergreen bushwood of the coastal land continues without great changes, the dry beds also are a refuge for the vegetation absent nearly everywhere else. They support several shrubs, such as *Trixis cacalioides, Galvesia limensis, Grabowskia boerhavifolia,* and *Wigandia urens,* a plant two meters high, sparsely branched, and with huge leaves.

B. THE HERB-POOR REGION OF COLUMNAR CACTI

I. The River Bank Bushwood

In this evergreen formation there ascend to rather high elevations various plants which on the coast are found on river banks, such as *Tessaria integrifolia, Salix chilensis, Caesalpinia tinctoria,* and *Schinus molle.* In addition there are others that are wanting or scarcer on the coastal land, like *Ficus* and *Alnus* trees, and among climbers *Cynanchum ecuadorense* and *Clematis* species. Just as on the coast, cultivation here has greatly reduced the natural vegetation, yet this has survived in places where agriculture has been

prevented by narrowness of the valley floor or by other circumstances. The most beautiful river bank thicket of this region I saw in a valley of the system of the Río Pativilca, when traveling from the port of Supe to Ocros. Old trees of *Salix chilensis*, *Alnus jorullensis*, and a *Ficus* with great spreading bracket-like roots, with liana stems of *Clematis dioica* as thick as an arm, were the stateliest objects between 1,300 and 1,800 meters above the sea. Farther up *Alnus* predominated and persisted as the only tree between 2,400 and 2,900 meters. Up to its top climbed *Muhlenbeckia tamnifolia* and *Colignonia Weberbaueri*, and on its branches perched broad-leaved rosettes of *Tillandsia interrupta* as large as a man's head.

II. The Vegetation Outside the River Banks

Xerophytes of various habit form a loose plant field that may be called mixed, mostly treeless, xerophytic formation. The columnar cacti, the huge leaf clusters of *Fourcroya*, the Bromeliaceae with thick, procumbent, much-branched stems, and the rainy-green shrubs are outstanding features of the vegetation. They are so scattered that room is left for many small patches of herbs that grow during the short rainy season of two to three months, when the shrubs also unfold their foliage. In some years the lowest part of the region receives so little rain that no new foliage develops.

In order to give some idea of the variety of the vegetation, the principal ecologic types may be listed, as follows:

Leafless plants with succulent stems: *Cereus* and *Cephalocereus*, smaller cacti of the genera *Opuntia* and *Melocactus*.

Leafy rainy-green shrubs with conspicuously thick branches: *Carica candicans*, one of the largest shrubs of this formation; *Jatropha* species, chiefly *J. macrantha*.

Bromeliaceae with thick, much-branched, prostrate, woody stems and evergreen leaf clusters: *Puya* and less frequently *Pitcairnia*.

Slender-stemmed Bromeliaceae with few or no roots and gray-hairy leaves: Tillandsias.

Plants with succulent leaves: *Fourcroya occidentalis*, and smaller plants like *Pilea globosa* and species of *Peperomia*, *Portulaca*, *Calandrinia*, and *Cotyledon*.

Leafy rainy-green shrubs without conspicuous thickening of the branches: The great majority of all shrubs. Among the larger ones is *Orthopterygium huaucui*, called *huancui*[1] near Lima, which

[1] The species name *huaucui* obviously resulted from an error in recording the vernacular name.

grows also as a small tree, and *Delostoma dentatum*. Species with densely hairy leaves are *Malvastrum Rusbyi*, *Loasa incana*, *Balbisia verticillata*, and *Onoseris integrifolia*. In some cases resin secretion serves as a protection against desiccation, as in *Kageneckia glutinosa*.

Leafy evergreen shrubs: The number is small. By means of leaves that conserve moisture or by deeply penetrating roots, or by both, it is possible for these shrubs to retain their foliage permanently. The most important is *Schinus molle*, which sometimes grows as a tree, though always smaller than on the river banks. Some individuals of *Caesalpinia tinctoria* and *Stenolobium sambucifolium* are green continuously, or at least for a long time. These three shrubs are among the largest ones of the formation.

Shrubs with scant or no foliage: *Ephedra americana*, *Monnina pterocarpa*, *Asteriscium* species.

Bulbous plants: few in number. Chiefly species of *Stenomesson* and *Oxalis*.

Tuber-bearing plants: *Commelina fasciculata*, *Anthericum eccremorrhizum*, *Peperomia* species with peltate leaves, *Boussingaultia diffusa*, *Ipomoea nationis*, *Oxalis* species, etc.

Annual herbs: I estimate that above Lima, between the limit of the desert region and 2,400 meters above sea level, two-thirds of all herbs are annual, and of these the Compositae are most numerous. The grasses take no prominent part as formation elements, either annual or perennial species.

Pteridophytes with protection against evaporation, such as wax secretion, viscous surface, scaly indument, or involution of the leaves or stems in dry weather; ferns of the genera *Pellaea*, *Cheilanthes*, etc., and *Selaginella peruviana*.

With respect to the distribution of the floral elements, the differences between lower and higher elevations must be emphasized first of all. Restricted to the former are *Melocactus*, *Cephalocereus*, *Cereus macrostibas*, *Grabowskia*, *Galvesia*, the *Jatropha* species of the subgenus *Cnidoscolus*, like *J. basiacantha*, *Monnina pterocarpa*, and *Orthopterygium huaucui*. The last occurs between 1,000 and 2,300 meters, and in places is the most frequent woody plant, but it does not seem to go northward beyond 11°. In the upper part of the region the columnar cacti are represented chiefly by a species nearly related to *Cereus peruvianus*. The xerophytic formation here includes some woody plants which in lower regions live only near watercourses, on account of the scant precipitation: *Schinus molle*, *Caesalpinia tinctoria*, and *Stenolobium sambucifolium*. The

flora of steep rock walls often is characterized by a preponderance of *Puya* and gray Tillandsias.

C. THE REGION OF THE GRASS STEPPE WITH SCATTERED SHRUBS

Its upper limit lies at 3,800 to 4,000 meters. The amount of precipitation is greater and the rainy season begins earlier and ends later than in the cactus region; and this governs the principal features of the vegetation. Rainy-green grass steppe with scattered shrubs is the most extensive formation. The majority of the grasses, like *Calamagrostis, Poa, Festuca,* and *Eragrostis,* are perennial, and many have narrow, firm leaves. Their height, exclusive of the flower stalks, is in many cases about half a meter, but may be much less. With the grasses are associated other herbs, partly and perhaps chiefly perennial. The shrubs are scattered, not in dense stands, and only a few of them exceed a height of two meters. Toward the end of the rainy season, after the climax of the vegetative and flowering season, the plant covering is densely tangled, and in favorable places the ground is completely covered. During the dry season the more delicate herbs disappear, but the tufts of perennial grasses remain standing in withered condition, and some shrubs retain part or all of their foliage. Consequently the season changes of the landscape are slighter here than in the cactus region. Extremely xerophytic organization is not an essential quality, and is represented by only a few cases. This is shown, for example, by the fact that cacti represent quite secondary elements, restricted to rocky places. Only certain tall Opuntias related to *O. subulata* are seen occasionally in great quantities, but that, as stated before, is the result of transportation by man or other animals.

The banks of the brooks and rivers lack the peculiar wood formations seen in the cactus region, which differ strikingly from their surroundings. Up to altitudes of 3,500 meters the development of woody plants is, indeed, more luxuriant along watercourses, and often they grow closer together here than elsewhere. However, they are mostly species that grow also in the grass steppe, since there is sufficient soil moisture for their needs. Some especially vigorous woody plants have a decided preference for wet ground of banks and springs. These include *Alnus jorullensis, Buddleia* and *Polylepis* species, *Sambucus peruviana,* which often becomes tree-like, and peculiar shrubs of the genus *Polymnia,* whose straight stems attain a height of five meters and when old become hollow by the shrinkage of their pith. But these trees and tall shrubs are

so irregularly scattered that they can not be considered typical formation elements. Moreover, they are planted for their medicinal properties, and for construction material and fuel, and many wild individuals have been exterminated, so that their original distribution is doubtful. Stony brook borders everywhere are decorated by a stately grass, *Cortaderia atacamensis*, visible from afar by its white panicles.

Above 3,500 meters the number of species of woody plants decreases, and these generally avoid the moist ground. Perhaps it is too cold for the shrubs of lower elevations, and they can live here only in dryer soil. Some high-Andean herbs descend lower in humid places than in dry ones.

The valleys of the Río Chiquián and of the Santa and the Tablachaca in their upper part follow more or less the main direction of the Andes, and are there separated from the coast by high mountains, so that they really should be considered as inter-Andean. The vegetation division is similar to that of the western slopes, but shows the influence of a moister, perhaps also warmer climate, especially in the region of the grass steppe. Here copious brooks, chiefly in humid gorges situated below glaciers, are bordered by bushwoods consisting of tall shrubs and small trees. These brook ravine bushwoods are distinguished by several east-Andean types, like *Weinmannia*, *Embothrium*, *Vallea*, *Brachyotum*, and *Gaultheria*. Rocky walls are covered with a multitude of broad-leaved, sparingly hairy Tillandsias.

6. The Puna of Central and Southeastern Peru

In central and southern Peru generally the name puna is given to the region lying above the limit of agriculture. The term is used here in almost the same sense; it ends below at 3,800 to 4,000 meters, and above on the highest summits. Excluded from it is the western Cordillera of southern Peru, since its high-Andean region shows a divergence of vegetation already described.

FLORA

While the floristic connection of the puna with the western part of the Andes, including the inter-Andean valleys, is very clear, a relationship with the eastern side is almost entirely wanting. From the former the puna is distinguished by the absence of nearly all the shrubs that grow there, and also by the possession of many peculiar species of such genera as often are found also in lower

regions: *Lupinus, Astragalus, Geranium, Viola, Gentiana, Valeriana, Cerastium, Senecio,* several genera of Gramineae, etc. Genera restricted to the puna or with few exceptions are: *Anthochloa, Aciachne, Distichia, Pycnophyllum, Arenaria, Draba, Nototriche,* several small genera of Cruciferae and Valerianaceae, *Azorella, Culcitium,* and *Werneria.* The flora of the puna is distributed according to altitude and also to the increase of humidity eastward and northward.

ORGANIZATION

A common peculiarity of the high-Andean plants is their slight elevation above the surface of the soil. In numerous species the stems and stalks, the leaf sheaths and petioles, the peduncles of the flowers and fruits, even the lower parts of the very flowers, are hidden in the soil. In other cases such organs or their parts are visible, but they remain very short or are appressed to the ground. This happens also with the blades of many leaves. All these modes of growth enable the plants to take advantage of the high temperatures of the uppermost soil stratum. Some of the underground organs likewise utilize this warmth. The subterranean stem portions also are generally short. The larger ones lie more or less horizontally, slightly below the surface. The length of the roots often contrasts strangely with the minute leafy shoots springing from them. Often they grow deep in the ground, but other long roots grow horizontally. In many species the old roots are replaced by new ones that arise near the surface, sometimes on other roots, sometimes on subterranean stems.

The leaves of the high-Andean plants are small, and either glabrous or more or less hairy. At times the hairiness is confined to the upper surface, or is denser there than beneath.

The great majority of puna plants are perennial herbs. If their stems are simple or sparingly branched and at the same time subterranean, so that only the leaves are visible, they are rosette herbs (*Calandrinia acaulis, Liabum bullatum,* species of *Nototriche, Hypochaeris*). The cushion-shaped plants are similar to them at the beginning of their development, but later their form is altered by continued branching, which little by little causes the stem ends to crowd together so as to form a large, compact mass. This mass, comparable to a cushion, may be flat (*Plantago rigida, Lucilia tunariensis,* species of *Azorella, Pycnophyllum, Werneria, Senecio*) or convex, with a hemispheric or conic form (*Azorella* species, *Aretiastrum Aschersonianum, Merope aretioides, Distichia muscoides*).

In the former case the branches often become independent individuals by the dying back of the older parts, as in *Lucilia tunariensis*. In the latter case they generally retain their organic coherence. At times the cushion plants become woody in their older parts, and thus may be considered as suffruticose.

A singular type of cushion plant is produced by certain Opuntias already mentioned with fleshy stems and reduced leaves. I refer especially to *Opuntia lagopus*, whose cushions are highly convex and thickly felted, and *Opuntia floccosa*, which has flatter and more loosely hairy cushions.

With herbs having stalks with elongate internodes it often happens that one individual produces numerous stalks standing close together, as in several Gramineae and species of *Lupinus*, *Culcitium*, *Senecio*, and *Apium*. Such growth forms resemble the cushions but are much looser, and may be called tufts.

Bulbous and tuber-bearing plants are but sparsely represented in the high-Andean region. Thick, turnip-shaped roots are often found, but on the whole they do not resemble typical storage organs; their length is greater than their diameter, and their consistency is woody rather than fleshy.

The woody plants are evergreen and have knotted, weirdly twisted branches. Their number is much smaller than that of the herbs. The shrubs grow sometimes spread out upon the soil or even partly under its surface, but sometimes they are erect. The type of leafless shrubs is represented by an *Ephedra*. Some species of *Escallonia*, *Gynoxys*, and *Polylepis* by their comparatively large size are exceptions to the generally dwarf vegetation of the puna. They attain a height of four meters, and grow as either shrubs or small trees. The most remarkable giant of the puna is *Puya Raimondii*, a tree of the Bromeliaceae whose height is as much as ten meters.

The change of the seasons alters the aspect of the high-Andean vegetation but little. Its influence increases toward the south, yet nowhere does it cause a complete general rest of vegetative processes. Humid places always retain their fresh green color. On water-poor soil the growth at the end of the dry period is less dense and of paler color than in the wet season, because many of the plants are dry, but new leaves are sprouting on plants of many species. The scant precipitation of the dry season also is useful to the high-Andean vegetation, for the vessels of these tiny plants are very short, and the tufts and cushions hold the water like sponges. Also,

the precipitation is almost always in a frozen or half frozen state. Snow flakes and hail stones melt slowly, and consequently their moisture can be utilized more completely than quickly running rain water. The reproductive organs are much more dependent on seasonal changes than the vegetative organs. The flowering of most species takes place in the moist months, from January to March, but with some it continues throughout the year.

FORMATIONS

The most important formations are the puna mat, the bunch grass formation, the *Distichia* moor, and the vegetation of the rocks and stone fields.

The puna mat (cushion and rosette) seems to be the richest of all formations in species. It occupies level or slightly sloping land of earthy or slightly stony soil with moderate water content. The vegetation is very dwarf, and consists chiefly of herbs, which form sometimes more or less scattered rosettes, sometimes tufts or cushions. Among them are certain prostrate shrubs like *Baccharis serpyllifolia*, *Astragalus* species, and *Ephedra*. Tall, tufted grasses and erect shrubs are wanting or very scarce. Lichens and mosses likewise are of minor importance. Everwhere growth-covered patches alternate with bare soil, and this prevails at high elevations.

In striking contrast to the abundance of bare patches is the crowding of the plants on growth-covered ones, and the sprouting of incongruous elements among the tiny stems of the tufts and cushions. Overgrown places seem to offer better conditions for the germination of seeds and development of young plants than the bare ones, and many seeds and fruits driven by wind or water are caught there. From the alternation of bare and plant-covered soil and by the manifold coloring of the leaves—pure green, yellow-green, and different shades of gray—the formation derives a characteristic dappled appearance. The color of the flowers, however, is of little importance, because small, insignificant blossoms predominate, and the larger, highly colored ones are widely scattered.

The bunch grass formation, which surpasses all others in extent, occupies earthy and earthy-stony slopes. The characteristic elements are vigorous tufts of perennial grasses, chiefly *Festuca* and *Calamagrostis* species, about half a meter high and separated by considerable spaces. All these tall puna grasses are called *ichu* by the native people. This formation also has many bare soil patches. The bunch grasses are accompanied by a large proportion

of the flora that exists on the puna mat. There are also many dicotyledonous herbs with enlarged stalks, and erect shrubs, but these are less frequent than on the stony fields and rocks that are to be described later.

The *Distichia* moor needs constant moisture underground, and therefore finds most favorable conditions for development on level land. It grows near lakes, and many a lake has been supplanted by this formation. Slow brooks are bordered in many places by the *Distichia* moor. It always retains a fresh green color, and in strong contrast with its surroundings, is closed, without gaps, and has neither bunch grasses nor shrubs. The characteristic plant is *Distichia muscoides*, which belongs to the Juncaceae. Its short, needle-shaped leaves end in a sharp point. The branches crowd together in highly convex cushions, which give the moor a wavy surface. and are so solid that one may cross by jumping from one to another without sinking in. When the ends of the branches grow upward, the lower parts are transformed into peat that serves as fuel for the shepherds and miners. *Distichia* is accompanied by several small herbs, especially in the hollows between the cushions, where puddles frequently are formed. In the lower part of the high-Andean region moist ground generally bears brook bank mat or meadow moor instead of the *Distichia* formation.

THE VEGETATION OF ROCKS AND STONE FIELDS

The formation of the *Polylepis* groves will be discussed elsewhere.

Lichens, mosses, ferns, erect shrubs, and tall-stalked herbs occur more abundantly in the vegetation of the rocks and stone fields than in the formations previously discussed. Among the lichens the crustaceous ones preponderate. The erect shrubs are rarely taller than half a meter, and belong chiefly to the Compositae (*Chuquiragua*, *Senecio*, and *Loricaria* species). Procumbent shrubs also are found. As examples of stalked herbs may be mentioned species of *Bomarea* (which are perhaps better called suffruticose plants), *Descurainia*, *Apium*, *Leuceria*, *Senecio*, and *Culcitium*. Tufted grasses are not rare.

Of greatest importance is the fact that on rocks and stone fields the vegetation reaches up to a greater altitude than on earthy soil. On the latter, vegetation disappears between 4,600 and 4,700 meters, while rocky or stony ground bears plants even above 5,000 meters, among them several flowering plants. Evidently the temporary

high heating of rocks and stones is, in this cold climate, of great value for plant growth. By this we can explain the fact that in these very places occur those more vigorous forms such as erect shrubs and caulescent herbs, whose habit reminds one of plants belonging to lower elevations, and that here the vegetation ascends higher than elsewhere. Thus rocks and stone fields are warmth oases on the lower margin of the cold desert, which comprises the highest part of the puna region and in places is covered with snow or glaciers.

In conclusion, several formations that are restricted to certain places may be considered.

THE POLYLEPIS GROVES

These are found scattered on the puna, chiefly in its western part. They cover, absolutely independent of watercourses, stony and rocky ground on the floor or walls of small highland valleys, often extend several kilometers, and reach up to the margin of perennial snow fields. The dominant plants are *Polylepis* species which attain a height of five meters and develop sometimes into shrubs, sometimes into small trees. Their stems and branches are covered with flakes of brown, paper-like bark, their leaves are hard and evergreen. On their branches Loranthaceae of the genus *Phrygilanthus* live as parasites. Perhaps because of the low temperature, there is no definite flora beneath them. In more open places bunch grasses and other herbs thrive. Of the few woody plants that in places are associated with *Polylepis*, the most frequent are *Gynoxys* species that reach a height of four meters and likewise are either shrubs or trees.

STANDS OF PUYA RAIMONDII

This gigantic, tree-shaped bromeliad grows in a few localities in the Department of Ancash and in the southern provinces of Lucanas, Aimares, and Calca. It is known by the names *llacuash* (north) and *titanca* (south). On grassy slopes it forms widely spaced stands, between 3,700 and 4,200 meters above sea level. The unbranched, erect stem bears a tuft of spiny-toothed leaves; when full-grown the stem is four meters high and is prolonged as a slender conical inflorescence six meters long, whose lower part is a scaly stalk. Below the tuft of green leaves the stem is densely clothed with dry leaves, which one seldom finds undamaged. They are burned by the shepherds, partly for fun and partly because the pasturing sheep are caught by the firm, hooked prickles of the leaf

borders and become so entangled that they can not get loose. The root system is weak and penetrates the ground but slightly. The flowers, produced in enormous quantity, are greenish white, and appear at the end of the dry season (October to December). After ripening its seeds, the plant dies.

6A. THE BASIN OF LAKE TITICACA

Lake Titicaca is situated 3,812 meters above sea level. Its surroundings, up to the height of 4,000 meters, are a territory of special character. The genus *Lepidophyllum*, so important an element in the western Andes and in a great part of the Bolivian "Altiplano," does not occur in this basin. There exist a good number of mesothermal shrubs which are absent in the puna. The flora can be classified as a mixture of microthermal and mesothermal elements, the relationship of the latter being western.

Among the formations the grass steppe is of the greatest extension, covering dry plains, also slopes except the rocky or very stony ones. The steppe contains scattered shrubs, such as *Tetraglochin strictum* which is the most frequent, *Adesmia* sp., *Colletia spinosa*, *Satureia boliviana*, *Solanum calycognaphalum*, *Grindelia* sp., *Senecio iodopappus*, etc. On the declivities shrubs are more numerous and higher than in the plains. During the season of little rain the steppe dries up, retaining a residue of dead leaves of the grasses.

The vegetation of the rocky or very stony slopes is an open formation composed of very varied types, especially herbs and shrubs. There also exist some Bromeliaceae (species of *Puya* and *Tillandsia*) and now and again small cacti (*Echinopsis* and *Opuntia*). We notice here a larger proportion of thermophilic elements than in the steppe.

Both still and running waters are surrounded by dense vegetation whose fresh green color contrasts with the pale aspect of the steppe and remains unchanged during the dry season. This vegetable covering of the moist soil is now the brook-bank mat, now the meadow moor.

In the numerous lakes and ponds live aquatic and semiaquatic plants. Among the latter the most stately is *Scirpus riparius*, called *totora* by the natives. Its associations form enormous bands on Lake Titicaca. The large stems of this plant are employed for making rafts and their sails.

Finally must be mentioned an interesting little tree belonging to the family Loganiaceae, *Buddleia coriacea*, known commonly by

the name *culli*. Its short and knobby stem has an evergreen crown, dark and dense; the leaves are hard and narrow and something like those of the olive. It is much cultivated in the villages of the Titicaca basin and is a characteristic element of the landscape. Although I did not find culli in the wild state, it seems probable that it belongs to the native flora of this territory.

7. THE INTER-ANDEAN VALLEYS SOUTH OF THE ELEVENTH DEGREE OF LATITUDE

Descending the rivers in these valleys, there are changes in the vegetation, which depend partly on the moister climate and partly on the increasing depth of the valleys. Near the western Cordillera below the puna where these rivers rise, there is usually a section of valley whose vegetation is about the same as that in the highest region of the western slopes of central Peru. Rainy-green grass steppe with scattered shrubs is the predominant formation. Along the brooks there are narrow strips of woody plants. In some valleys in the south the tola heath penetrates from the western Cordillera.

At greater depth in the valleys there appear on their floors and on the lower part of their walls xerophytic formations in which columnar cacti are conspicuous, with herbs and woody plants that have green leaves only during the short rainy season. At first these cactus formations are like those of the western Andean slopes, but farther down the valley they assume a different, savanna-like character because of the greater amount of grasses and the appearance of small trees. On the higher elevations of the valley walls one notices, approaching the eastern margin of the Andes, that the periodicity of the vegetation disappears more and more. The shrubs in the grass steppe become more numerous, until at last they unite in evergreen stands that are independent of the watercourses and alternate with patches of grass steppe. The shrubs here are partly elements of that east-Andean flora which we shall find in the ceja de la montaña. Thus in deeply cut valleys there is a strong contrast between the higher and lower parts of the valley walls; above the vegetation is hygrophilous, and below it is xerophilous.

A. THE VALLEY SYSTEM OF THE RIVERS APURIMAC, PACHACHACA, AND PAMPAS

From the mouth of the river Pampas downward the Apurímac Valley phytogeographically does not belong to inter-Andean but to eastern Peru. Therefore that part will not be considered here.

I. The Valleys of Chalhuanca, Pampachiri, and Aucara

I traveled along the Valley of Chalhuanca from its beginning to the place where it meets the Valley of Antabamba. By the confluence of the two rivers the Pachachaca is formed. In places the tola heath of the western Cordillera penetrates into this valley, as above Sañaica, where it descends to 3,700 meters. Then grass steppe with scattered shrubs becomes the dominant formation. After this, at 3,300 to 3,400 meters, follows the same treeless, herb-poor cactus vegetation which we have found on the western slopes of the Andes. In this, at 3,100 meters, we also find *Fourcroya*. At 2,700 meters the character of the cactus formation changes by the appearance of thick-stemmed, small trees of *Carica lanceolata*, which have a height of as much as ten meters, and are called here *jalasacha* ("naked tree") because they have leaves only during a short period. This plant becomes very frequent. At 2,500 meters the columnar cacti disappear, except a few isolated individuals, and the first low *Bombax* trees are seen. Shrubwoods in which, besides rainy-green types, the evergreen xerophyte *Dodonaea viscosa* takes prominent part, then become the main formation down to about 2,400 meters, where columnar cacti, probably of different species than those above, again appear as characteristic plants and, together with *Bombax*, etc., grow on grassy soil. Here begins the savanna-like xerophyte formation which we shall find in the valleys of the Pachachaca, Pampas, and Apurímac.

The valley of the Pampachiri, a river tributary to the Pampas, I saw only in its extreme upper part, where I observed that the tola heath descends to 3,600 meters, Another tributary of the Pampas, draining the valley of Aucará, I explored, descending from the western Cordillera down to a ford called Vado de Collay, which lies at 2,850 meters. From the western Cordillera onward the tola heath extends down to 3,600 meters. Farther north, at the same altitude, grass steppe with scattered shrubs takes its place. Below, the tola heath is succeeded by the treeless herb-poor cactus vegetation of the west. I did not reach its lower limit.

II. The Lower Valley Sections of the Pachachaca, Pampas, and Inter-Andean Apurimac

A. The region of the savanna-like xerophyte formations

Where the Apurímac cuts through the eastern Cordillera and finds an outlet to the tropical forest land, it meets with the Pachachaca, Pampas, and smaller rivers. Spreading out from this

territory, savanna-like xerophyte formations are the prevailing vegetation on the valley floors and the lower part of the valley walls. In the valley of the Apurímac they probably reach nearly to Cotabambas. They accompany the whole Pachachaca and border the lowest parts of the Río de Chalhuanca and of the Río de Antabamba, by whose union the first stream is formed. How far this vegetation extends in the valley of the Pampas is still uncertain. I studied it only in the valley of a tributary whose source lies southeast of Andahuaylas. The upper limit lies lower where the rivers approach the humid forest region of the east. At 13° 20′ it lies at 1,800 meters altitude in the Apurímac valley; farther south it is located at 2,400 meters in the same valley as well as in that of the Pachachaca.

The most characteristic plants are columnar cacti (*Cereus*), *Fourcroya*, *Puya*, *Pitcairnia*, and small trees of *Bombax Ruizii*, which the inhabitants call *pati*. Another low tree of this formation is *Piptadenia colubrina*. Species sometimes tree-like and at other times shrubby are *Acacia macracantha*, a *Prosopis* related to *P. chilensis*, *Cercidium praecox*, and *Aralia Weberbaueri* (*halhuinco*). Of frequent shrubs there may be mentioned *Kageneckia* species, *Jatropha* species, and an erect-growing *Ipomoea* with great white flowers and cordate leaves that is known by the people as *jemanta*. On branches and rocks gray Tillandsias grow exuberantly, for instance, *Tillandsia usneoides*. One of the main elements of the grass field, that is looser and lower than in the real savannas, is a *Bouteloua*, which is perhaps *B. curtipendula*. During the dry season most of the trees and shrubs lose their foliage, and the grasses and other herbs dry up. Only a few woody plants have evergreen foliage. Among them is *Schinus molle*, which, however, is scarce or entirely wanting in the proximity of the tropical forest region. *Caesalpinia tinctoria* also shuns this territory.

At some places, especially where gentle slopes or small depressions favor the gathering of rain water, the trees and shrubs of the savanna-like formation form loose rainy-green bushwood.

In some places the lateral valleys of the Apurímac have broad, flat, and gently inclined floors. In such localities the rivers are accompanied by tall, evergreen woods, containing shrubs and trees that may be called, according to the smaller or larger proportion of trees, bushwood or bush forest. Such evergreen bushwoods and bush forests of the river banks are found, for instance, below Abancay at 2,200 to 2,300 meters, and especially below Limatambo at 2,300 to 2,600 meters. The tallest tree is *Erythrina falcata*, called *pisonay* by

the people, and often planted in the villages of the departments of Cuzco and Apurímac. *Salix chilensis*, *Sapindus saponaria*, and a *Ficus* also develop into stately trees. *Escallonia pendula* (*pauca*), *Schinus molle*, *Alnus jorullensis*, and *Acacia macracantha* are sometimes trees and sometimes shrubs. As genuine shrubs may be named *Piper* and *Croton* species, *Stenolobium molle*, *Caesalpinia tinctoria*, and the naturalized *Spartium junceum*.

B. The upper regions of high valley walls

The vegetation of these places, lying between the xerophyte region and the puna, shows plainly that the humidity of the climate increases as we approach the tropical forest region, that is, going toward the north or northwest along the rivers Pachachaca and Apurímac, or toward the east following the Pampas. In place of the grass steppe which contains only scattered shrubs, there gradually appear stands of shrubs in which periodicity diminishes more and more until at last the evergreen type predominates. Between this hygrophilous vegetation and the savanna-like xerophyte formation lies a narrow, preponderantly rainy-green belt, in which bushwoods and shrubwoods alternate with grass steppes, while the cacti are scarce or entirely wanting.

B. THE INTER-ANDEAN PART OF THE URUBAMBA VALLEY

Between Torontoy and Colpani the Urubamba in its deep gorge breaks through the snow-crowned eastern Cordillera. Here, above Machu Piccho, ends the inter-Andean section of the valley. It presents in its vegetation and flora a great resemblance to the western Andean slopes of central Peru, except in its lowest part, where the influence of the moist eastern climate becomes evident. From the puna, where the Vilcanota (the uppermost part of the Urabamba) rises, the grass steppe with scattered shrubs extends down to 3,100 or 3,000 meters. Between 3,600 and 3,400 meters more or less from Sicuani to Checcacupe the grasses and other herbs often become scarce or are even wanting, and thus the ground between the shrubs is bare. The cause of these local anomalies is unknown. In some places the columnar *Cereus cuzcoensis* ascends to 3,550 meters. It grows chiefly on rocks and stone fields, also near houses and cultivated ground where it is planted for hedges, and occasionally becomes wild. The upper limit of *Schinus molle* lies comparatively high in this region, at 3,400 meters.

Between 3,100 and 3,000 meters a treeless, mostly herb-poor cactus formation begins whose characteristic plants are columnar

Cereus species, *Puya, Pitcairnia, Fourcroya,* and rainy-green shrubs. *Tillandsia usneoides* and other Tillandsias live on rocks and as epiphytes. Near the lower limit, which lies at 2,650 meters between Tanccac and Torontoy, the herb growth becomes denser and the number of shrubs increases.

The transitional region between the inter-Andean and east-Andean vegetation reaches from 2,650 meters down to 2,350 meters (Quellumayo). Grass steppe and loose thickets, often independent of watercourses, prevail here. The cacti become scarce and at last disappear. *Schinus molle* and *Caesalpinia tinctoria* cease being characteristic plants and retire to the floor of the valley, avoiding the moist air of the heights. At 2,350 meters some east-Andean types appear, such as *Bejaria, Clusia,* and *Oreopanax.*

Much shorter than the inter-Andean course of the Urubamba is the corresponding section of the river Paucartambo. Here again we find the uppermost and the lowest of the three regions of the inter-Andean Urubamba, but the middle one, that is, the cactus region, is almost completely suppressed. Only small remnants are recognizable near the town of Paucartambo, at 3,000 meters. A little below Challabamba the east-Andean vegetation may take the place of the inter-Andean one.

C. THE VALLEY OF THE MANTARO

This river has a strangely tortuous course. At first it runs southeast, then northwest, afterward north-northwest, and at last it is directed toward east-northeast. It flows into the Apurímac on the eastern side of the Andes at 400 meters. At the mouth of the Río San Bernardo[1] the inter-Andean part of the Mantaro valley ends. Its description follows:

I. THE VALLEY FLOOR AND THE LOWEST PART OF THE VALLEY WALLS

Three sections are distinguishable.

A. From the puna (somewhat above Oroya) to Ingahuasi

The elevation of the valley floor is 3,900 to 3,150 meters. The prevailing formation is grass steppe with scattered shrubs, in composition and life conditions similar to the corresponding vegetation of the western Andean slopes. Near Huancayo the valley has a broad, flat floor utilized almost wholly for agriculture, consequently it is only on the valley walls that there are patches of natural vegetation. Somewhat above Ingahuasi the valley becomes very narrow.

[1] Erroneously called Río San Fernando on Raimondi's map.

B. From Ingahuasi down below Tablachaca

The elevation of the valley floor is 3,150 meters down to 2,700 meters. Grass steppes alternate with shrubwoods. These often are independent of the watercourses and consist chiefly of rainy-green types, but they contain also some evergreen xerophytes. With diminishing altitude the periodicity of the vegetation increases. *Fourcroya* and columnar *Cereus* species grow here. *Tillandsia usneoides* grows on branches, and on the rocks are often found Tillandsias with broad, green, not gray, leaves. As examples of frequent shrubs may be mentioned *Piqueria peruviana, Jacobinia sericea, Pineda incana, Dodonaea viscosa, Maytenus andicola* (evergreen), *Cantua pyrifolia, Kageneckia glutinosa, Schinus molle* (evergreen,) *Caesalpinia tinctoria, Duranta triacantha, Colletia spinosa,* and *Stenolobium sambucifolium.* Restricted to moist brook ravines, there are evergreen bushwoods remarkable for their *Cedrela* and *Weinmannia* trees.

C. From Tablachaca to the mouth of the Rio San Bernardo

The elevation of the valley floor is 2,700 down to 1,100 meters. This section is characterized by its savanna-like xerophyte formations. The columnar Cerei and other cacti are represented by a larger number of species and individuals than in the foregoing part of the valley.

Above 2,300 meters the monotypic *Haplorhus peruviana* is the most important tree. It extends also into the preceding section. This evergreen xerophyte, which grows to about six meters and resembles a weeping willow, had not been found previously in any other part of Peru. With it are associated several decidedly rainy-green woody plants which become still more frequent farther down, for example, the small tree *Carica lanceolata* and isolated individuals of *Bombax Ruizii;* the either tree-like or shrub-like *Aralia Weberbaueri;* and the shrubby *Ipomoea* known as *jemanta.*

About Mayoc, at 2,250 meters, where the Mantaro turns back toward the northwest, is the dryest part of the valley. Trees, apart from those on the river bank, are hardly to be found, and the growth of herbs is so sparse that there are large naked patches of soil. Thus the vegetation exhibits here about the same aspect as in the cactus regions of the western Andean slopes of central and southern Peru. How far this extremely dry part of the Mantaro Valley extends downward is not yet known. The same vegetation

conditions exist in the valley of a tributary that comes from Ayacucho and empties near Mayoc.

I could examine the Mantaro Valley more carefully from the bridge of Huayo, which lies below Colcabamba at 1,500 meters, down to the mouth of the tributary San Bernardo. Here again the savanna-like xerophyte formation is typically developed and has a richer flora than in the preceding section. The characteristic plants are largely such as exist also in the inter-Andean valley system of the Apurímac. Among the small trees are *Bombax Ruizii*, first in abundance, *Piptadenia colubrina* (*huilco*), and *Acacia macracantha*. Species that are either trees or shrubs are *Caesalpinia corymbosa*, *Prosopis* species (closely related to *P. chilensis*), *Aralia Weberbaueri*, *Jacaranda acutifolia*, and *Cercidium praecox*. Of the many true shrubs there may be mentioned the *jemanta* (*Ipomoea* sp.), *Stenolobium* sp. (*S. arequipense?*), *Bursera gravolens* (*huancor*), *Jatropha longipedunculata*, and *Jatropha* sp. (*Cnidoscolus*). Except *Prosopis* and *Acacia*, perhaps also *Stenolobium* sp. (*S. arequipense?*), the woody plants mentioned are rainy-green. *Schinus molle* and especially *Caesalpinia tinctoria* are much rarer than in higher parts of the Mantaro valley. Besides the dicotyledonous woody plants, the columnar Cerei, *Fourcroya*, *Puya*, and perhaps also *Pitcairnia*, are important elements of this formation, as in other places. Of the grasses *Bouteloua curtipendula* is most abundant, but other common ones are *Heteropogon contortus*, *Nazia aliena*, *Pappophorum alopecuroideum*, and *Cottea pappophoroides*. In the herb fields there are many annual Dicotyledoneae and some tuber-bearing plants. *Tillandsia usneoides* and other gray-leaved Tillandsias grow as epiphytes. In depressions and along some watercourses the trees and shrubs of the savanna-like formation unite to form a preponderantly rainy-green bushwood.

As in the Apurímac system, here also the upper limit of the savanna-like formation lowers as we descend the river. This line runs at 2,800 meters along the upper part of the valley and at 1,800 meters in its lower part.

II. The Upper Regions of High Valley Walls

Here, also, the relation between the distribution of climatic humidity and the character of the vegetation is clearly visible. This changes in the same manner as in the corresponding regions of the Apurímac system. In the west there prevails the distinctly periodic formation of the grass steppe with scattered shrubs. It is especially well developed in some lateral valleys, as about Aco-

bamba and Ayacucho. Toward the east the periodicity diminishes, and the number of shrubs increases. At last evergreen woodlands alternate with slightly changing grass steppes.

Between this vegetation and the extremely xerophilous one there lies, as along the Apurímac, a transition belt, preponderantly rainy-green but poor in cacti, formed sometimes of grass steppes, sometimes of woody plants. Among the latter *Dodonaea viscosa* and *Adenaria floribunda* are frequent shrubs.

D. THE VALLEY OF TARMA

This is drained by one of the rivers tributary to the Perené, which empties into the Apurímac. In the part which is to be considered here the valley floor occupies an elevation between 2,700 and 3,800 meters. The lower region is distinguished by a treeless, herb-poor vegetation of cacti and rainy-green shrubs whose upper limit lies rather high, at 3,300 meters. Above this succeeds the rainy-green formation of the grass steppe with scattered shrubs. At 3,800 meters the transition to the puna takes place. Below 2,700 meters the grass steppe and shrubwood, both rainy-green, provide a transition between the dry Tarma Valley, that reminds one of the western slopes, and the moist evergreen regions of the east, which we shall consider later.

8. THE INTER-ANDEAN SECTION OF THE HUALLAGA VALLEY

Narrow at its beginning and in part ravine-like, the valley broadens from Ambo onward. Above there prevails grass steppe with scattered shrubs; then the shrubs become more numerous, and often form continuous stands, near or apart from the watercourses. Below 3,000 meters thermophilous xerophytes appear gradually, such species as *Caesalpinia tinctoria*, *Mentzelia cordifolia*, *Fourcroya*, *Cardiospermum*, columnar cacti, *Schinus molle*, *Acacia macracantha*, and *Jacaranda acutifolia*. Below 2,800 meters the periodicity of the grasses and most shrubby species is very evident, but *Schinus molle* and *Dodonaea viscosa* are abundant. These xerophytes are protected against desiccation by their resin content and other properties, and therefore remain green continuously or at least during a long season. At 2,200 meters the columnar cacti, which hitherto have been scarce, become characteristic plants, while the grasses recede, being represented only by small scattered annuals.

Thus originates that treeless, herb-poor xerophyte formation that has been mentioned so often. The most frequent representative

of the columnar cacti is a *Cephalocereus*. As in other places, here also the river banks of the xerophyte region differ; they support bushwood in which evergreen and rainy-green woody plants are mingled. To the former belong *Salix chilensis*, *Schinus molle*, and *Caesalpinia tinctoria;* to the latter a shrubby *Bauhinia*, *Jacaranda acutifolia*, which varies between tree and shrub form, and the *huilco* tree, *Piptadenia colubrina*. About the town of Huánuco the valley is dryest. Approximately twelve kilometers below Nuestra Señora del Valle, near the Hacienda Cochas, the cacti begin to disappear, and again a rainy-green grass steppe intermixed with shrubs appears. Here the inter-Andean section of the Huallaga Valley ends, and its vegetation now passes into the east-Andean one. It may be added that the flora of the inter-Andean Huallaga Valley includes some east-Andean types, like *Embothrium grandiflorum* and shrubby *Epidendrum* species.

9. THE INTER-ANDEAN VALLEY OF THE MARAÑÓN, FROM ITS BEGINNING TO 6° 30′

In the inter-Andean Valley of the Marañón, longest of the inter-Andean valleys, a change of vegetation similar to that along the Mantaro and the Apurímac is produced by the increase of the humidity northward.

A. THE UPPERMOST PART AND THE LATERAL VALLEY OF THE RIO PUCCHA

The lower limit of the valley system to be described lies more or less at the mouth of the left tributary, the Puccha, at 9° and at an elevation of 2,100 meters. In general, the division is the same here as on the western Andean slopes of central Peru, above the desert, but the climate is moister and, as the upper limits of the tropical cultivated plants show, also warmer than there. Two regions may be distinguished: a lower one, characterized by a treeless, herb-poor xerophyte formation, composed of columnar cacti (*Cereus* and *Cephalocereus*), rainy-green shrubs, *Fourcroya*, *Puya*, etc.; and an upper one, whose main vegetation is the grass steppe with scattered shrubs. The limit lies in the Puccha Valley at about 3,000 meters (isolated the columnar cacti ascend to 3,200 meters), but at the Marañón apparently lower, at 2,800 meters. As in the valleys of the Santa and the Río de Chiquián, here also one finds in some parts of the grass steppe region brook ravines, bushwoods with east-Andean elements, and steep rock walls covered with

broad-leaved, mesophytic Tillandsias. Among the most imposing objects of the first formation are old trees of *Buddleia incana* (*kisuar*). On the eastern valley wall of the Marañón the proximity of the moist eastern regions is indicated by the great number of shrubs in the grass steppe and their occasional union in small stands.

B. THE SECTION LYING BETWEEN 9° AND 6° 30′ S.

I. The Main Valley

On the whole, the vegetation arrangement is in accordance with the lower valley sections of the inter-Andean Mantaro and the inter-Andean Apurímac. The valley floor and the lower part of the valley walls are characterized by the savanna-like xerophyte formation with columnar cacti, small rainy-green trees, etc. In both the following regions, the middle one strongly periodic and the uppermost slightly so, shrub formations alternate with grass steppes. In the species present there is a resemblance to those southern valleys, good examples being *Jacaranda acutifolia, Cercidium praecox, Piptadenia colubrina, Caesalpinia corymbosa,* and *Banisteria leiocarpa.* Further species also deserve mention, such as *Bombax discolor, Stenolobium rosaefolium,* and *Jatropha Weberbaueri* in the north, and *Bombax Ruizii, Stenolobium arequipense* (or a related species), and *Jatropha longipedunculata* in the south.

A. The lowest region

Along the valley walls the upper limit of the savanna-like xerophyte formation sinks from 2,300 meters in the south to 1,500 meters in the north. Among the cacti, besides the columnar plants of *Cereus* and *Cephalocereus,* there are smaller representatives, like *Melocactus.* All the trees are low ones, the most frequent being the rainy-green *Bombax discolor* (*pati*). There are other *Bombax* species, at least occasionally tree-like, decorated with great white flowers; and *Caesalpinia corymbosa, Cercedium praecox, Pithecolobium Weberbaueri, Piptadenia colubrina, Leucaena trichodes,* and *Jacaranda acutifolia,* all rainy-green. Among the shrubs are *Cardiospermum Corindum* (tendril-bearing), *Krameria triandra, Stenolobium rosaefolium, Gochnatia* sp., and *Jatropha* species (subgenera *Adenoporium* and *Cnidoscolus*), which lose their leaves in the dry season, while a shrubby *Vallesia* always bears green foliage. With these are associated in the north the evergreen, shrub-like or tree-like *Capparis scabrida,* and the rainy-green shrubs *Bougainvillea peruviana* and *Banisteria leiocarpa.* Among the monocotyledonous

xerophytes *Fourcroya, Puya, Pitcairnia, Deuterocohnia longipetala,* and the gray Tillandsias always retain their leaves. The grasses are green for only a short time. They are low and widely spaced, and in many places wanting. The main species are *Bouteloua racemosa* and *Aristida adscensionis.*

In depressions many of the woody plants unite in rainy-green bushwood. In these *Piptadenia colubrina,* here called *huayo,* is sometimes dominant.

The river banks occasionally support a partly evergreen bushwood with *Sapindus saponaria, Cassia fistula, Caesalpinia pulcherrima, Muntingia Calabura, Cordia rotundifolia, Tessaria integrifolia,* and *Gynerium sagittatum.*

B. The middle region

The upper limit of this drops northward, from 2,900 to 2,500 meters. Shrubwoods alternate with grass steppe, first one, then the other prevailing. In the shrubwood, chiefly rainy-green, there grow *Gochnatia* sp., *Kageneckia glutinosa, Piqueria* sp., *Llagunoa nitida, Annona Cherimolia* (wild, primitive type), *Schrebera americana, Stenolobium sambucifolium* and *S. rosaefolium, Jacaranda acutifolia, Leucaena trichodes;* also, as more or less evergreen xerophytes, the very frequent *Dodonaea viscosa, Caesalpinia tinctoria, Acacia macracantha,* and the rarer *Schinus molle.* Restricted to the north are the rainy-green shrubs *Caesalpinia insignis, Cantua quercifolia,* and *Elutheria microphylla.* In some places isolated trees rise above the shrubwood, for instance *Bombax discolor,* though not ascending beyond 2,400 meters; and some species mentioned among the shrubs, which occasionally become trees. The above enumeration shows that the woody plants are in part those occurring in the savanna-like formation. The grasses of the steppe wither during the dry season; they are taller and more closely spaced than in the lowest region. The columnar cacti are scattered or entirely lacking.

C. The uppermost region

This differs from the foregoing region by its less definite periodicity and by its flora, composed of less thermophilous species. Among these one notices types of east-Andean affinities, like *Embothrium grandiflorum, Vallea stipularis, Brachyotum, Oreopanax,* and *Coriaria myrtifolia.* The prevailing vegetation consists sometimes of grass steppes through which numerous shrubs are scattered, and sometimes of loose shrubwoods. The grasses grow even closer together than in the middle region.

II. THE LATERAL VALLEYS

Generally the vegetation here shows the composition typical of the main valley, and only the great basin of Cajamarca differs. It is a section of the largest of the valley systems, connected with the Marañón Valley between 9° and 6° 30′. The main river is the Río Crisnejas, which is formed by the junction of the Río de Huamachuco, coming from the south, and the Río Cajamarca, which drains the northwest. The latter flows through the broad, flat floor of the above-named basin, whose climate possibly may be relatively dry. The city of Cajamarca, to be sure, lies in a marshy plain; but elsewhere, especially in the east, there are wide tracts of arid soil where there are no springs or brooks. The predominant vegetation of the Cajamarca basin is clearly periodic, a poor, low grass steppe, in which are scattered small shrubs and half-shrubby plants. To the latter group belongs the very frequent *Cuphea serpyllifolia*. Like this feeble plant growth, the distribution of the cacti also indicates the scarcity of water. The columnar cacti ascend higher than in the Marañón Valley at the same or even much more southern latitude; they are still frequent above San Marcos at 2,600 meters, and near Jesús at about 2,700 meters. Perhaps the dryness of the Cajamarca Basin is caused partly by the unusually porous soil, or by the thin layer of earth. However, one must remember that the Andes are very broad there, and consequently the middle part may receive less rain than the margins.

10. THE JALCA OR NORTH PERUVIAN PARAMO

The region situated above the limit of agriculture is called jalca in northern Peru. Between 8° 30′ and 6° 30′, west of the Marañón, the jalca occupies an extensive, sometimes broad and sometimes narrow surface that is partly broken. It corresponds to the puna of central and southern Peru, but has a lower elevation. The limit of agriculture, which on the margin of the puna is at 3,800 to 4,000 meters, sinks from 3,800 meters in the southern part of the jalca to 3,600 meters or even to 3,400 meters in the north. This may be explained partly by the fact that in the north the climate is moister, the sky is cloudier, and the fogs produce a cooling effect during the whole year. Furthermore, the Andes become lower from 8° 30′ northward, and as a result the vegetation regions move downward in accordance with a recognized law of phytogeography. We find there ridges and summits that are exposed to thunderstorms, hailstorms, and rough winds at an elevation where farther south there

are sheltered valleys. West of the Marañón the extreme northern snow peak of Peru is the Huaylillas or Nevado de Huamachuco (about 7° 45′ S. Lat.), but it rises to an elevation of only 4,900 meters, and therefore loses its snow cap in some years. The greater part of the jalca has an elevation of less than 4,000 meters. In northern Peru snow falls are much rarer than hails and do not occur at all from 7° northward.

The flora, especially on the higher summits, contains some elements reminiscent of the puna, such as *Nototriche, Azorella, Lucilia tunariensis, Werneria, Culcitium longifolium,* and *C. canescens.* Evidently there is a floristic relationship also with the paramos of Ecuador. The organization is less peculiar in the jalca than in the puna. Rosette and cushion plants are not so frequent here as there.

The general appearance of the vegetation is dominated by the microthermal grass steppe, which usually is free of shrubs. Because of the humid climate, there is no periodicity, nevertheless the term "steppe" is justified, because the grasses have narrow, hard, dry leaves. They are evidently adapted to endure for a long time. The grass steppe of the jalca differs from the bunch grass formation of the puna by the denser growth of the tall grasses. In very moist tracts of land that are uninhabited and not grazed by cattle, the grass field is so dense that the feet become entangled in it, and walking is difficult. This density is increased by the dead blades, which do not decay readily because of the low temperature. Where the grassland is pastured, the shepherds set fire to the grass from time to time to hasten the sprouting of young and therefore soft and juicy leaves. From this I suspect that sometimes the taller grasses stand in isolated tufts similar to those of the puna, where this phenomenon is not linked with human influence. The taller grasses belong chiefly to the genera *Calamagrostis* and *Festuca.* Among the grasses other herbs grow as secondary elements. *Brachyotum* species, and especially the needle-leaved *Hypericum laricifolium,* are shrubs characteristic of the transition from the generally shrub-free grass steppe of the jalca to the adjacent lower region, where shrubwoods alternate with grass steppes.

Unlike the grass steppe, the vegetation of the rocks includes many shrubs, species of *Ribes, Calceolaria, Diplostephium, Senecio,* and *Chuquiragua.*

On the moors, besides *Sphagnum, Carex, Werneria Stuebelii,* and other smaller plants, there are convex cushions of *Werneria humilis,* large, hemispheric tufts of a grass, *Danthonia sericantha,*

and the shrub *Loricaria ferruginea*, whose flattened branches and densely imbricate, scale-like leaves remind one of cypresses. Plants of the genus *Puya*, which we have found so often as an extreme xerophytic group, also inhabit these moors. Certain species become two and one-half meters high at flowering time. Semi-humid ground is covered with brook bank mat, which contains no high grasses.

Similar to the jalca or identical are vegetation regions seen at some places in the western Cordillera north of 6° 30′; also others that lie from north to south on the eastern slopes of the Peruvian Andes.

11. The Western Slopes of the Andes Between the Rio Moche and the Rio Sana

Here, between 8° and 7° S., the vegetation of the western slopes changes from one of central Peruvian character to a northern one. The increasing humidity northward is attested by the fact that the upper limit of the desert and that of the cactus region descend considerably, and that the woody plants are more numerous than on the western slopes of central Peru. The upper limit of the desert sinks from 700 meters at 8° to 300 meters at 7°. Between the desert and the jalca three regions can be distinguished. In the lowest, small trees (*Bombax*, etc.) are associated with columnar cacti and other xerophytes; the two succeeding regions are distinguished by their alternation of shrubwood or sometimes bushwood with grass steppe. In the second region these formations are rainy-green; in the third and wettest, slightly periodic to evergreen. A similar arrangement of the vegetation, but extended farther southward, we have found in the valley system of the Marañón, between 9° and 6° 30′. But on the western slopes, between 8° and 7°, the evergreen wood formations of the third region have a greater extension and are of more vigorous growth than in the inter-Andean section of the same latitude, and the cactus formation does not reach so high. This leads to the conclusion that the western slopes receive greater quantities of rain and are oftener watered by the fogs, to which reference has been made before in the description of the Cajamarca Basin. In the valley system of the Río de Chicama dense fogs are said to reach down to 1,600 meters in the rainy season.

With regard to the flora, the relation is closer to that of the inter-Andean valleys of the same latitude, and especially those of the extreme north, than to that of the western slopes of central Peru.

A. THE LOWEST REGION

The upper limit descends from 1,800 meters (south) to 1,200 meters (north). The general character of the vegetation is determined by the savanna-like xerophyte formation, with columnar cacti (*Cereus* and *Cephalocereus*), small rainy-green trees, especially *Bombax discolor*, rainy-green shrubs, *Puya*, *Deuterocohnia*, and herb poor fields. Among the small trees are also *Acacia macracantha*, *Cercidium praecox*, *Bursera graveolens*, and the evergreen *Capparis scabrida*, which ascends from the coast to 1,600 meters. *Fourcroya* is found only occasionally. *Hymenocallis amancaes*, an ornament of the central Peruvian lomas, is said to be one of the commonest plants here.

Belts of evergreen bushwood grow along the rivers. Besides the woody plants and reeds which inhabit river banks of the cactus region in central Peru, we find here trees of *Myrica pubescens* and *Phytolacca Weberbaueri*, and tall shrubs, *Coccoloba Ruiziana* and *Schoepfia* species.

B. THE MIDDLE REGION

This terminates above between 2,500 and 2,600 meters. The most extended formation is rainy-green shrubwood, above which, in some places, rise small trees, particularly *Bombax discolor*. The characteristic shrubs are *Caesalpinia tinctoria*, *Carica candicans* (or a closely related species), *Acacia* sp. (also tree-like), *Llagunoa nitida*, *Sebastiania* sp., *Croton* sp., *Jatropha* sp., and *Kageneckia glutinosa*. To these is sometimes added the evergreen *Schinus molle*. Columnar Cerei enter this region but sparingly. Between the shrubs *Fourcroya* spreads its large-leaved clusters. Rainy-green grass steppe sometimes replaces the shrubwood.

C. THE UPPERMOST REGION

At 3,400 to 3,600 meters this region comes in contact with the jalca occupying the highest part of the mountains, as related before. Evergreen woody plants take a prominent part. They unite to form large shrubwoods, or more rarely bushwoods, containing both shrubs and trees. On these are epiphytes—lichens, mosses, ferns, Tillandsias, and a few orchids. The most extended and tallest woody formations are found between 2,600 and 3,200 meters. The woods alternate with grass steppes through which numerous small shrubs are scattered. Above 3,200 meters this formation prevails, the most frequent shrubs being *Hypericum laricifolium* and *Brachyotum* species. The grasses are perennial and clearly influenced by the

change of the seasons, yet less than those of the preceding region. Among the woody plants are many elements of that mesothermal flora which in central and southern Peru is almost entirely confined to the eastern slopes of the Andes, for example, *Clusia*, *Viburnum*, Melastomaceae, Lauraceae, *Embothrium*, Myrtaceae, *Oreopanax*, *Vallea*, *Chusquea*, *Bocconia*, *Palicourea*, *Hedyosmum*, *Bejaria*, and *Siparuna*.

12. The Western Slopes and Inter-Andean Region of the Extreme North

A line fluctuating between 7° and 6° 30′ limits this section toward the south. The mountains are considerably lower and in few places do they rise above 3,500 meters. North of 6° altitudes of 4,000 to 4,100 meters are reached only by isolated peaks. Between 6° and 5° 30′ the passes of the western Cordillera, over which one travels from the coast to Huancabamba Valley, have an elevation of but 2,200 to 2,300 meters, and the road leading from Huancabamba to the Tabaconas Valley ascends to only 2,700 meters.

The floristic character is determined principally by certain xerophytes and mesophytes which in Peru inhabit the north exclusively or chiefly and in part occur also in Ecuador and Colombia. Examples are *Capparis scabrida*, *C. mollis*, *Chorisia insignis*, *Jatropha Weberbaueri*, *J. peltata*, *Elutheria microphylla*, *Carica leptantha*, *Bombax discolor*, *Coccoloba Ruiziana*, *Bougainvillea peruviana*, *Streptosolen Jamesoni*, *Mayepea pubescens*, *Stenolobium rosaefolium*, *Cantua quercifolia*, *Stemodia suffruticosa*, *Cervantesia tomentosa*, *Schoepfia* sp., and *Amicia glandulosa*. Some of these plants do, indeed, pass the seventh degree of latitude toward the south, but from there on become rarer. The last of such floristic elements disappear at about 8° on the western slopes and at 9° in the Marañón Valley. The foregoing remarks refer to lower and middle elevations. Higher up the flora shows other relationships, being dominated by hygrophytic mesothermals which in central and southern Peru belong almost wholly to the eastern slopes. Most of the species are evergreen woody plants.

Formations of woody plants hold an important part in the vegetation, and have a greater extension than between 8° and 7°. They sometimes occupy exclusively great tracts of land; again, they alternate with grass steppe. In higher regions both formations are evergreen, in lower ones mostly but not always rainy-green. The microthermal grass steppe that we have found in the jalca is restricted

to the few places where the mountains surpass an altitude of 3,400 meters. Several inter-Andean valleys show by their plant growth that they are dryer than the mountain borders of both sides.

A. THE WESTERN SLOPES

The savanna-like xerophyte formation with columnar cacti, scattered small trees, and low, ephemeral grass field still forms a narrow belt at 6° 30′, reaching up to 450 meters at the foot of the Andean slopes; at 5° 30′ it retreats to the hills of the inner coastal land, where we have found it before. It finally disappears in the Department of Tumbes at 4° 6′. It is worth noting that *Bombax discolor* is replaced by other small trees, and that *Fourcroya*, *Puya*, and *Deuterocohnia* also are absent. Therefore this savanna-like formation is not altogether equivalent to that existing in the inter-Andean valleys and, between 8° and 7°, on the western slopes. Disregarding this formation, there are on the western slopes of the Andes, north of 7°, three regions: a lowest rainy-green one, a middle transitional one, and an uppermost evergreen one. However, between 6° and 5° 30′ the mountains are so low that the evergreen region is absent or is reached only by isolated summits.

I. THE LOWEST REGION

This reaches up to 1,600 meters in the south, then becomes narrower, and at last ends between 900 and 1,000 meters in the north. It may be called the region of rainy-green bushwood, since it is almost completely occupied by this formation. It consists chiefly of trees, shrubs, and columnar cacti. The most frequent tree is *Bombax discolor*, here called *pasayo*. Among other trees may be mentioned *Caesalpinia corymbosa*, *Erythrina* sp., *Bursera graveolens*, and *Loxopterygium huasango*. Toward the north the number of tree species increases. There another *Bombax* takes a prominent part as the tallest and most conspicuous tree of the formation; its thick, green, prickly trunk is either cylindric or spindle-shaped, and is buttressed at the base. There are also evergreen xerophytes, *Capparis scabrida* and *C. mollis*, that are either shrubs or trees. The undergrowth consists of rainy-green shrubs—*Coccoloba Ruiziana*, *Mimosa acantholoba*, *Pithecolobium excelsum*, *Cordia rotundifolia*, and many others. A singular plant is *Carica leptantha* (*C. paniculata?*), which in its low growth approximates a shrub. From a thick, subterranean, tuberous stem that stores water rises the aerial stem; this grows about one and one-half meters high, is unbranched,

and during the rainy season develops a tuft of large, long-petioled leaves, from whose axils spring panicles of rose-colored flowers.

Besides the trees and shrubs, essential formation elements are the columnar cacti, such as the tree-like *Cereus Cartwrightianus*, and in the south also *Cephalocereus*. *Fourcroya* is frequent in the south but rare in the north. The branches of the trees and shrubs are festooned with luxuriant but slender-stemmed, woody or herbaceous vines. To the former belongs *Bougainvillea peruviana*, decorated with rose-colored bracts, which occasionally grows without support, the tendril-bearing *Cardiospermum Corindum*, and the twining *Marsdenia cundurango*. Many herbaceous climbers, like Convolvulaceae, Cucurbitaceae, *Tourettia lappacea*, and *Cobaea campanula*, develop in astonishing luxuriance during the rainy months; like green robes they are densely entwined and cover shrubs and small trees. Another type of vines is represented by *Cereus polyrrhizus*, whose green, three-winged stems adhere by aerial roots and unfold their huge, white flowers in the crowns of the trees. The epiphytes also are conspicuous, principally *Tillandsia usneoides* and other gray Tillandsias, and less often ferns, aroids, and orchids.

On the river banks woody plants of the rainy-green bushwood are associated with others that demand greater humidity. There the wood formation grows taller and at times assumes the form of bush forest. Some trees and shrubs are evergreen; other rainy-green ones retain their foliage longer than on dry soil. Here the trees are *Celtis* sp. (*palo blanco*), *Pithecolobium multiflorum* (*angolo*), *Salix chilensis*, *Sapindus saponaria*, *Cervantesia tomentosa*, *Hura crepitans*, *Guazuma ulmifolia*, *Acacia macracantha*, *Ficus* sp., etc., and the shrubs *Schoepfia* sp., *Thevetia peruviana*, and others.

II. The Middle Region

The upper limit lies in the south at about 2,600 meters, in the north between 1,800 and 2,000 meters. Shrubwoods and tree-poor bushwoods alternate with grass steppe or with mixed herb fields in which grasses are not more numerous than other herbaceous plants. The woody plants are partly evergreen, partly rainy-green. The grasses and other herbs wither during the dry season. Cacti are scarce or absent. *Anona Cherimolia* (wild), *Caesalpinia tinctoria*, *Amicia glandulosa*, *Cantua quercifolia*, *Clusia*, *Croton*, *Llagunoa nitida*, *Dodonaea viscosa*, *Lantana*, *Streptosolen Jamesoni*, *Tibouchina cymosa*, and *Chusquea* are examples of frequent woody plants. Among them *Fourcroya* grows occasionally.

III. The Uppermost Region

Because of the moist climate and the frequent fogs, which occur now and then even in the dry season, the vegetation has quite a different aspect from that of the lower part of the western slopes. Evergreen wood formations of shrubwoods, bushwoods, or tall bush forests rich in trees, alternate with slightly periodic grass steppes, in places also with carpet meadows, that is, low, evergreen fields of soft, juicy grasses and other herbs. Most of the woody plants have hard leaves and bear an abundance of epiphytic lichens, mosses, ferns, and flowering plants. These evergreen woods of the fog region, both ecologically and floristically, show great similarity to the vegetation on the eastern slopes of the Andes in the ceja de la montaña, and they are even more luxuriant and richer in species. On the other hand, we have found similar formations, also in inter-Andean valleys and between 8° and 7°, on the western slopes, but those are of less extent and luxuriance than the woods of the extreme north.

B. THE VALLEY OF THE RIO QUIROZ

The Río Quiroz flows in a deep, narrow valley, separated from the coastal plain by mountains rising to about 3,500 meters, and finally comes out into the coastal land, where it unites with the Río de la Chira. Here, also, three regions are distinguishable. The limit between the lowest and middle regions fluctuates between 1,200 and 1,500 meters; the uppermost begins at 2,500 meters.

I. The Lowest Region

This is clearly rainy-green, and it is inhabited by *Capparis scabrida*, *C. mollis*, *Bursera graveolens*, *Acacia macracantha*, *Loxopterygium huasango*, *Bombax discolor*, another *Bombax* easily distinguished by its spindle-shaped, green, prickly trunk, *Carica leptantha*, *Cercidium praecox*, columnar cacti (*Cereus* and *Cephalocereus*), *Fourcroya*, etc. There is also a small tree of the genus *Ipomoea*, and *Chorisia insignis*, a tree twenty meters high with a spindle-shaped trunk covered with prickles, and with large, white flowers that appear at the beginning of the dry season, after the leaves have fallen. The trees and shrubs form only small, open woodlands, alternating with mixed herb fields. The same vegetation exists—judging by photographs given by Bosworth (Geology of Northwest Peru, London, 1922, *figs. 114* and *115*)—on the northwestern part of the Amotape Range that penetrates the coastal land on the opposite

or right-hand side of the Chira River. In both cases the formations are similar to those of the park-like xerophyte vegetation that occupies the coast land of Tumbes, but they differ by the presence of many epiphytes.

II. THE MIDDLE REGION

Its woody plants are partly rainy-green, partly mesophytic evergreen. Shrubwoods and bushwoods alternate with small patches of rainy-green grass steppe. Besides many species that occur in the corresponding region of the western slopes, there are others, like the shrubs *Stemodia suffruticosa, Escallonia paniculata, Elutheria microphylla,* and *Barnadesia laurifolia,* and the small, rainy-green tree, *Mayepea pubescens.* Cacti are absent or scarce.

III. THE UPPERMOST REGION

This resembles the corresponding region of the western slopes, but the grass steppe that alternates with the evergreen wood formations seems to be of greater extent here than there.

C. THE INTER-ANDEAN VALLEYS BETWEEN 6° 30′ AND 6°

At this latitude there are valley sections of the Marañón, the Utcubamba, and the Chamaya; the greater part of the valley of the Río Llaucán, which at 5° 58′ empties into the Marañón; and last, the valley of the Río Chotano, that first flows toward the west, then nearly to the north, where it unites with the Huancabamba, thus forming the Río Chamaya.

Leaving aside minor local differences, the same distribution of formations rules as was described for the western slopes north of 7° of latitude. The flora is similar to that of the west, but richer. Some of its peculiarities will be noted in the following descriptions of the three regions.

I. THE LOWEST REGION

On the valley walls the upper limit of this region sinks from 1,800 meters in the south to 1,500 meters in the north. The predominating formation is rainy-green wood growth, containing many columnar cacti. Usually shrubs and small trees grow together as bushwood; less frequently shrubs occur alone. Among the trees are *Acacia macracantha, Prosopis chilensis, Chorisia integrifolia* (with spindle-shaped, prickly trunk), *Capparis scabrida, C. mollis, Leucaena* sp., *Saccellium lanceolatum, Jacquinia pubescens* (*llisha,* also called *llishina,* conspicuous by its orange-red flowers), *Jacaranda acutifolia* (*yaravisco*), *Piptadenia colubrina* (*huayo*), *Hura crepitans* (*catagua*),

Bombax discolor, Cercidium praecox, Pithecolobium Weberbaueri, Tetrasida polyantha, Cybistax sp., *Tecoma grandiceps* (*guayacán*), and *Clusia* sp. (evergreen). Some of these species grow also as shrubs. Examples of true shrubs are *Ipomoea crassicaulis* (growing erect), *Cordia rotundifolia, Bougainvillea peruviana* (generally not climbing but erect), *Jatropha, Parosela, Caesalpinia insignis, Mimosa pectinata, Pithecolobium excelsum, Croton, Gochnatia, Swartzia Mathewsii,* and the evergreen *Vallesia dichotoma.* With these are climbing shrubs with tendrils, such as *Cardiospermum Corindum* and *Serjania,* or those with twining stems, like *Prestonia* and *Mandevilla.* Cacti are represented chiefly by columnar *Cereus* and *Cephalocereus* species, and by Opuntias with flattened joints, *Melocactus,* climbing *Cereus,* and *Pereskia horrida,* which also climbs sometimes. *Fourcroya* is here the largest plant with succulent leaves. The Bromeliaceae are represented by terrestrial types, such as *Pitcairnia* and *Deuterocohnia,* and by gray, epiphytic Tillandsias. *Phaedranassa megistophylla,* a frequent bulbous plant, receives the popular name of *oreja de burro* because the shape and size of its leaves suggest a donkey's ear. The hygroscopic *Selaginella Mildei* is the commonest of the Pteridophytes.

Along the river banks the wood growth becomes taller, and the foliage of the rainy-green plants persists longer than elsewhere. Here grow certain evergreen trees which, like *Sapindus saponaria, Salix chilensis,* and *Guazuma ulmifolia,* also exist on the coast or, in a few cases, are eastern elements belonging to the flora of the montaña, like *Triplaris* and *Ochroma lagopus;* further, the nearly rainy-green *Juglans neotropica,* which grows on the banks of the Utcubamba, has its proper home in the tropical region of the eastern slopes of the Andes.

II. THE MIDDLE REGION

The upper limit of this fluctuates between 2,600 and 2,000 meters, and lies higher in the south than in the north.

Woody growth of mixed rainy-green and mesophytic evergreen types alternates with rainy-green grass steppe, first one, then the other of these formations predominating. The woody growth is sometimes shrubwood, sometimes bushwood, of mixed trees and shrubs. The cacti usually are missing. Frequent shrubs are *Eleutheria microphylla, Llagunoa nitida, Stemodia suffruticosa, Streptosolen Jamesoni, Cantua quercifolia, Dodonaea viscosa, Adenaria floribunda, Stenolobium rosaefolium, Exostema peruvianum, Embothrium grandiflorum, Caesalpinia tinctoria, Acacia, Croton, Rapanea,* and *Clu-*

sia. Woody plants that are either shrubs or small trees include a wild form of *Anona Cherimolia*, and a *Lafoensia* called in some places *chuspa* and in others *pocol*.

III. THE UPPERMOST REGION

This agrees essentially with the corresponding region of the western slopes, but it is often richer in species and more luxuriant. In many parts the evergreen woody growth of the fog region covers enormous tracts without interruption of grass steppe. Frequently it is a bush forest that contains tree ferns, stately mesothermal palms (*Ceroxylon*), and tall dicotyledonous trees.

D. THE INTER-ANDEAN VALLEY OF THE HUANCABAMBA

The Río Huancabamba after flowing southward turns toward the southeast. North of the sixth degree of latitude the Huancabamba Valley is the dryest part of the Peruvian Andes. Coming from the coast at the end of the rainy season, one notices a surprising change after reaching the summit of the pass and descending to this river—on the western slopes rainy weather, muddy roads, green vegetation; here sunshine, dry soil, withering herbs, and falling leaves from the woody plants. Under such conditions I crossed the western spur of the western Cordillera at 5° 20′ in April, 1912, and at 6° in May, 1915. The dryness of the climate is clearly perceptible by the fact that the formations of the lowest region, characterized by cacti, are comparatively poor in trees, and reach upward very high, much higher than on the western slopes at the same latitude and also higher than in the more northern Quiroz Valley, as well as in the adjoining southern ones. Greater similarity with the neighboring regions is visible in the middle and uppermost region, but the dryer climate of the Huancabamba Valley is evident here also.

I. THE LOWEST REGION

On the valley floor the upper limit of this region lies somewhat above the town of Huancabamba, approximately at 2,200 meters. Cultivation of the banana and sugar cane extends nearly as high, up to 2,100 meters. On the right-hand valley wall that line remains at the same elevation until about 6°, where the valley ends; but it sinks on the left-hand wall, toward the south, to 1,500 meters. The columnar cacti (*Cereus* and *Cephalocereus*), as well as the strongly pronounced periodicity of the woody plants and of the scant herb growth, characterize the whole region. Otherwise there are differ-

ences on which two subregions may be based, a lower and an upper one. The former is dominated by a savanna-like formation; in the latter trees are almost entirely absent except in the immediate vicinity of watercourses. On the valley floor the two subregions touch at 5° 30′. On the right-hand valley wall the vegetation of the upper subregion extends much farther toward the south than on the left one.

The savanna-like xerophyte formation, by which the lower subregion is distinguished, reaches up to 1,600 meters on the right-hand valley wall, and to 1,500 meters on the opposing one. It exhibits here approximately the same aspect as in the Marañón Valley between 9° and 6° 30′, and as on the western slopes between 8° and 7°. Small rainy-green trees, especially *Bombax discolor*, rainy-green shrubs, columnar cacti, and terrestrial Bromeliaceae (*Pitcairnia* and *Deuterocohnia*) are scattered over an ephemeral, low, and open grass field (*Aristida adscensionis*, *Bouteloua*, etc.). Of small trees there are *Acacia macracantha*, *Prosopis chilensis*, *Capparis scabrida*, *Cercidium praecox*, *Loxopterygium huasango*, and *Caesalpinia corymbosa*. Among the shrubs are *Cordia rotundifolia*, *Galvesia limensis*, *Vallesia dichotoma*, etc.

The tree-poor xerophyte formation of the upper subregion includes, among others, the following shrubs: *Mimosa montana*, *Caesalpinia tinctoria*, *Acacia*, *Porlieria*, *Elutheria microphylla*, *Croton*, *Dodonaea viscosa*, *Mentzelia cordifolia*, *Cantua quercifolia*, *Lantana*, *Stenolobium huancabambae*, *Helianthus verbesinoides*, and *Salvia discolor*, which is conspicuous by very dark violet, almost black flowers. *Schinus molle* is here as in the north generally, much rarer than in central and southern Peru. Besides the larger cacti, there is a small *Opuntia* with flat joints that occurs in large quantities. It is called *lalo*, and is esteemed for its well-flavored fruits. *Fourcroya* is more frequent here than in the lower subregion. On the river banks, inhabited by *Salix chilensis*, *Alnus jorullensis*, and *Escallonia pendula*, *Bryophyllum pinnatum* grows luxuriantly in the undergrowth.

II. THE MIDDLE REGION

The middle region reaches up to 2,300 meters in the south and 2,600 meters in the north. In general, rainy-green grass steppe containing scattered shrubs prevails, and the dense woody formations are of slight extent. These shrubwoods and bushwoods, composed of rainy-green and evergreen types, I found well developed on the left-hand valley wall about San Felipe, where at 1,500

meters they adjoin the savanna-like formation. To give an idea of the floristic composition there may be mentioned *Clusia, Mayepea pubescens* (*chuquil*), *Streptosolen Jamesoni, Satureja vaccinioides, Llagunoa nitida, Kageneckia glutinosa, Dodonaea viscosa, Caesalpinia tinctoria, Croton, Jacaranda acutifolia, Acacia macracantha, Cacosmia rugosa,* and *Esenbeckia Warscewiczii* (*angohuara*). Special mention should be made of the striking difference already mentioned that exists here between the left (eastern) and the right-hand walls of the Huancabamba Valley. While the cactus vegetation ends on the former at 1,500 meters, it ascends on the latter to 2,200 meters. This leads to the conclusion that the left side, where the mountains are about 1,000 meters higher than on the right, has a moister climate.

III. The Uppermost Region

The grass steppe, alternating with evergreen shrubwoods and bush-woods, is more extensive than in neighboring parts of the mountains.

E. THE BASIN OF BELLAVISTA AND THE SURROUNDING MOUNTAINS

Between the mouth of the Chamaya and the Pongo de Rentema the Marañón flows in a broad valley, on whose even floor, encircled by hills, it receives on the left the Chinchipe and on the right the Utcubamba. This section of the Marañón Valley may be called the basin of Bellavista, from a small village lying nearly in the middle, at 441 meters. The Pongo de Rentema is the first of the gorges by which the Marañón breaks through the low front ranges of the Andes.

Although the valley floor and the lowest slopes of the mountains both have a long dry season, and the vegetation and flora are closely related to those of the adjacent southern valleys, and, as there, remind one somewhat of the coast land, the middle and uppermost regions of the neighboring mountains are distinguished by a moist climate, and phytogeographically they are similar to the eastern slopes of the Andes. Three regions can be recognized: the lowest one is macrothermal rainy-green, the middle one macrothermal evergreen, and the uppermost mesothermal evergreen. In the first and second grass steppe and woody formations alternate; the third is occupied by woody formation. The cacti are restricted to the lowest region and are frequent there in the wood formations.

I. The Macrothermal Rainy-green Region

The upper limit of this fluctuates between 900 and 1,100 meters. The wood formations, generally composed of shrubs and small

trees, and to be called bushwoods, do not differ much from those occupying the lowest region of the adjoining southern valleys. Special attention should be called to the fact that here as there the bushwood of the river banks, in which the trees grow taller and are partly evergreen, has no palms, Cyclanthaceae, or Scitamineae, and in general shows little relationship with the flora of the montaña. In the grass steppe, which always contains scattered shrubs, there are conspicuous large tufts of *Sporobolus mirabilis*, sometimes associated in pure stands.

II. The Macrothermal Evergreen Region

Above, this ends between 1,800 and 2,000 meters. Some of its plant associations reappear on the eastern slopes of the Peruvian Andes. Grass steppes without definite periodicity alternate with bushwoods formed of tall shrubs and small trees; less often shrubwood replaces the bushwood. Many of the woody plants have hard foliage. The grass steppe contains, besides thermophilous grasses (*Andropogon bicornis, A. leucostachyus, Trachypogon Montufari*), some Cyperaceae, like *Dichromena globosa*, and dicotyledonous herbs (*Onoseris* sp., *Chelonanthus camporum*); some half-woody plants (*Kohleria spicata, Rechsteineria ignea, Borreria capitata, Hyptis lantanaefolia*); and small shrubs (*Sobralia violacea, Perilomia Benthamiana*). The woody formations are composed of Melastomaceae, Lauraceae, *Psidium* and other Myrtaceae, *Piper, Lantana, Rapanea, Clusia, Bejaria, Viburnum, Cybistax, Luehea paniculata, Dictyoloma peruvianum*, and *Condaminea corymbosa;* also conspicuous small trees of the genus *Hyptis*, related to *H. Tafallae*, which are ornamented with pendulous, lilac-colored panicles.

On the borders of the wood formations the primitive form of *Ananas sativus* grows wild. Here and there the slopes are covered by bracken thickets of *Pteridium aquilinum*, whose fresh green contrasts with the yellowish or brownish green grass steppe and thus is recognizable from a distance. The rivers are bordered by taller bushwood in which many of the woody plants have soft foliage, sometimes also by bush forest. Here grow stately trees of *Cinchona Condaminea*, also certain types of the tropical rain forest, for example, middle-sized palms of the genus *Bactris* and a bulbous herb of shady places, the beautiful *Eucharis grandiflora*.

III. The Mesothermal Evergreen Region

This region, often enveloped in fog, is almost wholly occupied by those evergreen wood formations that we have found already

in many parts of northern Peru. Patches of grass steppe, which interrupt the woody growth, exist only above 2,850 meters.

THE EASTERN SLOPES

On the eastern side of the Peruvian Andes the structure of the mountains is more complicated than in the west, therefore I should like to indicate more definitely the part of them counted as eastern in this description. Between the northern end of Peru and ten degrees of latitude, eastern Peru is severed from the inter-Andean part by a chain formerly called the Central Cordillera, but later correctly named the Eastern Cordillera by Sievers. North of 6° this Cordillera is comparatively low; it runs along the eastern side of the Utcubamba and is broken by the Marañón in the Pongo de Rentema. Farther south the eastern Cordillera becomes higher, and is the watershed between the rivers Marañòn and Huallaga.

Less distinctly eastern Peru is separated where the Huallaga, flowing eastward, leaves the inter-Andean part of its valley. South of the tenth degree of latitude the eastern slope is at first marked by the river systems of the Pachitea and the Perené, which are separated from the Huallaga and the Mantaro sources by high mountains. To the Perené also belongs a valley section lying below Tarma, in which again a gradual transition takes place from the inter-Andean to the east-Andean vegetation and flora. Another division is provided by the mountains rising between the Perené and the upper Mantaro.

On the lower, east-northeastward course of the Mantaro a distinct phytogeographic limit is wanting. There inter-Andean and east-Andean vegetation are separated by a high range, which sends its waters on one side to the middle Mantaro and on the other to the Apurímac, and at last penetrates into the angle formed by the Apurímac with its left tributary, the Pampas. Later the limit runs along very high mountains crowned by mighty snow peaks and cut by the Apurímac and the Urubamba. In the deep valleys of these rivers both vegetation types intermix. At last eastern Peru reaches to the watershed between the Madre de Dios and the Inambari on one side and the Urubamba and Lake Titicaca on the other.

The east is the moistest part of Peru, consequently its vegetation consists mostly of evergreen woody growth. There is a definite dry season only in the southern half of the country, and even there not throughout.

13. THE CEJA DE LA MONTANA

The upper, temperate to subtropical part of the eastern slopes receives in many districts the name of ceja de la montaña (brow of the forest), as distinguished from the lower, tropical part, called montaña. Upward the ceja extends in the north to altitudes between 3,400 and 3,600 meters; in the center and south sometimes even higher, to about 3,900 meters. The lower border is generally at 1,800 meters. With increasing distance from the main chains of the Andes, the vertical extension of the ceja vegetation is, indeed, restricted by the lowering of the mountains, but its characteristics become more and more evident. On the last branches of the Andes, ridges and summits between 1,200 and 1,800 meters are covered by woody formations similar to those of the ceja, but showing certain differences dependent on the moderate elevation. From the north to the south of Peru the vegetation and flora of the ceja on the whole remain the same, and this uniformity continues beyond the political boundaries, chiefly in the north.

Constant fogs characterize the climate of the ceja. They are formed especially on the exposed summits and ridges open to the eastern winds. The fog veils not only bring great humidity but moderate the light and equalize the relatively low temperature.

To indicate the nature of the flora of the ceja, I may point out its relationships to the montaña on the one hand and to the west on the other. Many types of the montaña, as the majority of its palm genera, the Musaceae (*Heliconia*), Zingiberaceae, Marantaceae, and the genera *Monstera* and *Hevea*, do not ascend to the ceja, or reach only its lowest part. On the other hand, it differs from the montaña by the greater abundance of tree ferns, Ericaceae, Lobeliaceae, and Compositae, and yields such genera as *Berberis, Hesperomeles, Ribes, Monnina, Fuchsia, Polylepis, Vallea, Gunnera, Viola, Geranium, Bomarea, Calceolaria*, and *Thalictrum*, which are absent or only of sparing occurrence in the montaña.

On the western side the floristic separation of the ceja is clearly pronounced in middle and southern Peru, except for certain valleys in which a gradual transition takes place. *Schinus molle, Caesalpinia tinctoria, Acacia*, and cacti are elements of the west that are wanting or appear only sporadically in the ceja. On the other hand, in the ceja are the western limits for *Sphagnum* (except isolated localities), several fern genera, *Podocarpus*, nearly all *Chusquea* species, the palms, Eriocaulaceae, Monimiaceae, Aquifoliaceae (*Ilex*), Theaceae, Marcgraviaceae, *Gaiadendron*, and *Cin-*

chona; most Araceae, Orchidaceae, Lauraceae, Melastomaceae, Araliaceae, Ericaceae, and Gesneriaceae; and many other types that determine the nature of the eastern flora. In the north this great contrast vanishes, because many east-Andean mesothermals cross the Andes to the western side, especially in the evergreen woody formations of the fog region. Nevertheless the ceja retains even in the north some distinctive features, for it has contact and floristic exchange with the tropical forest country of the neighboring Hylaea, while below the evergreen woody growth of the inter-Andean and western regions lie xerophytic formations.

The predominating vegetation of the ceja consists of evergreen woody formations. They are either shrubwoods or bushwoods composed of shrubs and small trees, or bush forests containing trees that are taller but never so tall as in the tropical rain forest of the montaña. One of the most striking peculiarities of this vegetation is the hard, coriaceous foliage of many woody plants. Another is the abundance of epiphytic ferns and flowering plants, as well as lichens and mosses, that cover the ground and envelop the stems or branches. Among the frequent lichens are large streamers of *Usnea,* and hygrophilous types like *Leptogium, Sticta,* and *Stictina;* on the soil are *Cora pavonia, Baeomyces imbricatus, Glossodium aversum, Stereocaulon,* and *Cladonia.* Springy sphagnum cushions scattered over the ground are the most conspicuous representatives of the mosses. The moist climate produces a great number of Hymenophyllaceae.

The shrub formations, especially, have hard foliage. In the bushwoods and bush forests this character is restricted to the trees and taller shrubs, and the undergrowth consists of soft-leaved plants. The trees are generally species that may develop also as shrubs. The knotted branches and twigs of the woody plants are densely crowded and twisted in all directions, and interlaced to form dense and often flattened crowns. It is difficult to penetrate these wood formations; the feet sink in the network of stems and roots, whose meshes are filled with loose lumps of mosses and lichens and with rotting plant remains. Here terrestrial plants and epiphytes can not be distinguished clearly.

The charming tree ferns, the elegant rosettes of epiphytic Tillandsias, the slender, gracefully curved *Chusquea* stems, whose ends, ornamented with tufts of narrow leaves, incline and resemble artistically arranged festoons—these are the most attractive objects that emerge from the gloomy plant tangle of fog-veiled bush forest.

In the shrubwoods the eye rejoices at the ever present display of flowers, the red or yellow coloring of young shoots, the glistening sheen of the foliage. The shrubwood predominates on the ridges and summits, the bushwoods and bush forest in the depressions that favor tree growth by their soil and their protection against wind.

These typical woody formations of the ceja cover huge regions in which, as far as the eye can reach, no other vegetation is visible, but in the upper part of the ceja the woody growth is divided into patches that alternate with dense grass steppes and small moors. These interruptions commence between 2,800 and 3,450 meters, in most cases probably between 3,000 and 3,300 meters. The wood patches often extend upward in ravines, and with increasing altitude they regularly become smaller. The trees are of lower growth, occur less frequently, and at last disappear. The height of the shrubs also decreases upward. The leaves of the woody plants are of different form from those at lower elevations, being on the average smaller and narrower, often involute, and more hairy, especially beneath.

In regions of drier climate, where a great part of the eastern humidity is caught by the ranges of the Andes, grass steppes alternate with woody formations also at lower elevation. This happens especially in certain valleys of middle and southern Peru. The wood formations in such cases are poorer in trees, epiphytic flowering plants, mosses, and lichens, and richer in soft-leaved shrubs than at equal elevation in the ceja proper. Besides, the vegetation shows distinctly the influence of seasonal changes (almost entirely wanting in true ceja), above all in the grass steppe.

The wood formations are interrupted by small areas of carpet meadows. These are low, evergreen, succulent lawns, composed of grasses and other herbs. Where I have seen them, they were originated or at least enlarged by human interference. One finds them always near the so-called tambos, huts built solely to shelter travelers. From the woody growth fuel for cooking meals is taken, and with increasing destruction the carpet meadow is enlarged to become pasture for mules and horses.

Where the mountains are very high, even the small wood patches and isolated shrubs disappear from the grass steppe. Then pure microthermal grass steppe appears, similar to that of the jalca but still denser. Such grass steppe regions often constitute a transition between ceja and puna in eastern Peru.

14. THE MONTANA

According to the present division, the upper limit of the montaña lies around 1,800 meters, about as high as tropical agriculture extends.

A. FLORA

The floristic differences between montaña and ceja have already been discussed. In connection with it I may mention certain plants of the montaña which here extend very high, sometimes even into the lowest part of the ceja. *Monstera*, the Musaceae (*Heliconia*), and the Zingiberaceae (*Renealmia* and *Costus*) have their upper limits between 1,800 and 2,100 meters. *Bactris*, *Cyclanthus*, the Marantaceae, and *Triplaris* disappear between 1,500 and 1,700 meters; *Iriartea*, *Astrocaryum*, *Phytelephas*, and *Carludovica palmata* between 1,200 and 1,500 meters. On its lower borders the montaña is closely related to the Hylaea. Perhaps it is not to be separated from the latter, although it exhibits certain types, like *Cinchona*, *Bejaria*, *Cavendishia*, *Gaultheria*, and *Embothrium*, that have clear affinities with the Andean flora. In addition, there are interesting immigrants from distant, eastern xerophyte or subxerophyte regions, such as *Dilodendron*, *Dictyoloma*, *Luehea paniculata*, *Curatella*, *Physocalymna*, and *Cybistax*.

B. THE PRINCIPAL FORMATIONS

The vegetation associations vary greatly; hydrophytic, hygrophytic, subxerophytic, and xerophytic formations exist near one another. I call hydrophytic the matorral; hygrophytic, the tropical rain forest; subxerophytic, the evergreen, hard-leaved shrubwoods and bushwoods, besides the evergreen grass steppe; xerophytic, the rainy-green savanna and the rainy-green savanna wood formation. The two last xerophytic formations are restricted to certain valleys of middle and southern Peru.

I. THE TROPICAL RAIN FOREST

This evergreen formation covers flat land as well as slopes. On the ground dead masses of foliage interrupt the carpet of scattered moss tufts, Selaginellas, low ferns, and small herbaceous flowering plants. Above these rise other ferns, *Cyclanthus*, Araceae, Scitamineae, slender-stemmed, dwarf palms (*Geonoma*, *Chamaedorea*, etc.), and herbaceous or woody dicotyledons; and last, the most robust elements of the undergrowth, the stemless tufts of large-leaved palms, partly such as retain this mode of growth, like *Phy-*

telephas and *Carludovica palmata*, partly those that later develop into trees.

The type of erect shrubs is not clearly defined. The woody plants of the undergrowth are little branched and have the tendency to produce a simple stem. For the most part they are juvenile phases of lianas and trees, but others always remain small, like species of *Piper*, *Palicourea*, and *Cephaelis*, as well as several Acanthaceae and Melastomaceae. Between the undergrowth and the roof of the forest tree tops, trees of varied size spread their crowns. The higher palms (*Iriartea*, *Bactris*, *Euterpe* species) are overtopped by certain dicotyledonous trees. The crowns of these often have the trunk divided into few very long, straight, ascending branches on which the leafy branches appear only at great height, and are there densely crowded together, so that the crown is shaped like an inverted cone.

The branches of the highest tree tops are often twisted and knotted. Just as in the erect woody plants, there is a vertical gradation in the lianas and epiphytes. The Malpighiaceae, Sapindaceae, Apocynaceae, and Bignoniaceae climb into the uppermost region, and only there leaf and flower freely, but root-climbing Araceae (*Anthurium*, *Philodendron*, *Monstera*), Begonias, and Gesneriaceae, twining *Dichorisandra* species, and others remain in lower, moist, and shady vegetation strata. These are preferred also by certain epiphytes, especially ferns and Peperomias, as well as by some leaf- and bark-inhabiting mosses and crustaceous lichens. Quite different are the epiphytes of sunny tree tops: Parmelias, Physcias, and the small Usneas, and the mosses; and the small, narrow-leaved orchids with pseudobulbs, whose xerophytic habit recalls rock plants. In the higher strata of vegetation there are also parasitic Loranthaceae, representing a type of branched shrubs that is rare below.

Finally there are in the montaña the following phenomena, common in all rain forests of tropical zones: buttresses at the base of tree trunks; pendulous twigs and leaves; large and often thin leaf blades; "drip-tips;" yellow, red, or whitish coloring of the young foliage; long, pendent, aerial roots; cauliflorous inflorescences; frequence of small flowers without conspicuous coloring; frequent separation of sexes in flowers. At the borders of the forest, whether natural, like those of river banks, or artificial, as the result of plantations or roads, the lower vegetation strata become more

dense, in consequence of the abundant light. Here there is a wall, composed chiefly of shrubs, reeds, and lianas.

At high elevations, near the ceja, the tropical rain forest gradually changes into a lower bush forest.

II. THE MATORRAL

Along rivers, or even on swampy land sometimes flooded, the matorral generally replaces the tropical rain forest. This formation consists of an exceedingly dense undergrowth and scattered trees. The undergrowth is composed of Scitamineae, reeds (*Gynerium sagittatum*), erect, long-branched shrubs and half-shrubs (*Piper* species, *Sanchezia oblonga*, etc.), and slender-stemmed, herbaceous or somewhat woody climbers (Vitaceae, *Mucuna rostrata*, *Ipomoea* and *Gurania* species). Among the trees rising here and there above this thicket, palms (*Iriartea*, *Bactris*, *Euterpe*) are well represented, and *Cecropia* and *Triplaris* are always prominent. Even if the matorral on the whole is to be considered an evergreen formation, some of its dicotyledonous trees (Bombacaceae, *Erythrina*, *Sapium*) lose their foliage at the time of low water in the rivers. Among the tall woody plants of the matorral are bamboo shrubs of the genus *Guadua*. The climbers of the undergrowth occasionally ascend on the trees, and when their green mantle clothes dead trunks that have lost their crowns, picturesque columns and cones are formed. The matorral formation is poor in shade plants, especially ferns.

A. The evergreen, hard-leaved shrubwoods and bushwoods

More common than real shrubwood is a bushwood in which tall shrubs grow with small trees. In several of these (*Maprounea guianensis*, *Luehea paniculata*) the bark is chinky and crusted. The leaves of numerous woody plants are hard, parchment-like or coriaceous, and of middle size, but usually they are below the foliage of ceja shrubwoods in hardness. The leaves vary from completely glabrous to hairy only or chiefly on the under side, and a conspicuous hair covering of equal density on both sides is rare. Although some species (*Maprounea guianensis*, *Cybistax* sp., *Dictyoloma peruviana*, *Luehea paniculata*) lose their foliage at the time of minimum rainfall, new leaves soon appear, usually before the trees are entirely bare. Lichens, mosses, low herbs, epiphytes, and lianas have a minor role in this formation. Lichens and mosses are represented by a few xerophytic types, the lianas by several slender-stemmed plants.

The scarcity of the Hymenophyllaceae and other hygrophytic ferns, Cyclanthaceae, Araceae, and Scitamineae is to be emphasized. Succulents and leafless plants are absent, except in few cases. There is no scarcity of brilliantly colored flowers. Of the woody plants in these formations, besides those named, the following are important: *Rhus juglandifolia, Fagara culantrillo, Cosmibuena obtusifolia, Condaminea corymbosa,* species of *Piper, Embothrium, Roupala, Siparuna, Mauria, Clusia, Vismia, Bejaria, Rapanea, Hyptis* (some up to four meters high, decorated with large, lilac-colored panicles), *Palicourea, Siphocampylus, Vernonia,* Anonaceae, Lauraceae, Melastomaceae, Myrtaceae, and Araliaceae. Many of these develop as either shrubs or trees. The type of monocotyledonous shrubs is represented by orchids, *Epidendrum* and *Sobralia.*

This evergreen shrubwood and bushwood generally alternates with grass steppe, or often with thickets of *Pteridium aquilinum.* The latter often appear where woods have been cleared.

B. The evergreen grass steppe

This covers slopes principally, sometimes, where watercourses are absent, also level ground; sandy as well as clay soils are adapted to it. Essential seasonal changes are not perceptible. The prevailing plants, grasses and Cyperaceae, never interrupt their vital activities; they constantly renew their narrow, hard, yellowish green leaves, and flowering occurs, at least in certain regions, at all times. In uninhabited districts, where men do not interfere, the earth is completely hidden under a thick tangle. Where there are settlements, the covering becomes looser, because the inhabitants from time to time burn the grass in order to destroy the old straw and obtain fresh pasture; a few days later the steppe becomes green again. It attains an average height of half a meter. Woody plants are completely absent over wide tracts, and they appear principally where the steppe touches wood growth. At such places not infrequently stand stunted trees of *Curatella americana.*

The flora of the grass steppe is poor. Of frequent and widely diffused species there are among the grasses a number of Paniceae and *Andropogon* species, also *Trachypogon polymorphus* and *Saccharum cayennense;* and among the Cyperaceae the genera *Bulbostylis* and *Dichromena* (*Bulbostylis junciformis, B. capillaris, Dichromena globosa, D. glauca*). Among the grass-like plants grow herbs and half-shrubs, species of *Epistephium, Bletia, Chelonanthus, Borreria,* and *Escobedia scabrifolia,* known as *palillo.* Upward this

grass steppe reaches sometimes to 2,200 meters with only slightly varied flora.

C. The rainy-green savannas

The rainy-green savanna is best developed in the valleys of the Urubamba and its tributary, the Yanatili. The following description is based on observations made there.

The savanna ends above between 1,400 and 1,500 meters, below between 800 and 600 meters. The season from May to July is rainless, in August there are scant rains, and in September the real rainy season begins. From the grass field of the savanna rise isolated half-shrubs, shrubs, and small trees often only a few meters high. The grass field is open and attains a height of one-half to one meter, including the flowering culms. During the humid months it is of a beautiful light green; in the dry season it withers completely. Most of the grasses are perennial, species of *Andropogon* supplying the principal elements. Among the frequent shrubs are species of *Croton, Jatropha, Melochia, Sida, Lantana, Hyptis,* and *Vernonia.* The trees are represented by *Curatella americana, Eupatorium crenulatum* (both only three meters high), *Cybistax* sp. (only three to four meters high), *Luehea paniculata* (up to five meters), *Dilodendron bipinnatum,* and probably also *Rhus juglandifolia.* Some of these trees, perhaps all, grow also as shrubs. In the rainless months the trees and shrubs shed their leaves. Variously shaped lichens, pendent tufts of *Usnea,* for example, cling to the trunks and branches of the trees. The quantity of mosses is insignificant.

The savanna region is of small extent in the Apurímac Valley below the mouth of the Pampas, and in the Mantaro Valley below the mouth of the San Bernardo. In both cases the upper limit lies between 1,600 and 1,800 meters; the lower one is still to be determined.

D. The rainy-green savanna bushwood

In the region of the savanna this formation is frequently replaced by savanna bushwood, especially on steep slopes near rivers and in depressions which, though not having watercourses, yet gather rain water. The trees and shrubs, grouped in thin stands, are in great part species of the savanna, but of taller growth than there. With them are associated several other trees, like *Dictyoloma peruvianum,* the occasionally dominant *Piptadenia colubrina* (*huilca*), and Bombacaceae with prickly trunks; and shrubs such as *Psidium guajava* and *Pogonopus tubulosus,* five meters high, visible from afar by the large, rose-colored sepals. Succulent plants, absent in the

savanna, are represented here by a slender *Cereus* up to twelve meters high, a curious tree-like *Opuntia* (*O. brasiliensis*), and *Fourcroya*. The floor vegetation is scant. The meager epiphytic flora consists of *Tillandsia* species, especially *T. usneoides*, some orchids, and a few *Rhipsalis* species. The lianas have slender stems, and their number of species is small. Araceae are rare, and palms, Cyclanthaceae, and tree ferns are wanting.

Near the water rainy-green woody plants grow with evergreen ones, or are completely replaced by them, so that the formation becomes an evergreen bushwood.

C. THE DISTRIBUTION OF THE FORMATIONS; CONNECTION BETWEEN THE MONTANA AND THE CEJA

Owing to the great difficulties of travel in the montaña, the distribution of its formations is still imperfectly understood. It is apparent, however, that at many places in the mountains subxerophytic and xerophytic formations prevail, while the low front ranges and the plains of the east are covered with tropical rain forest and matorral.

Between 5° 45′ and 5° 55′ subxerophytic evergreen bushwood dominates in the valley of the Río Yambrasbamba, which, with a northwestward course, flows into the Marañón. About Rioja, Moyobamba, and Tarapoto, where wide, partly swampy plains extend between low mountain ranges, and where the Río Mayo runs toward the Huallaga, there is a complicated alternation of matorral, tropical rain forest, subxerophytic evergreen bushwood, and evergreen grass steppe. Through tropical rain forest and matorral wind the Marañón, almost from Pongo de Retema on, and the Huallaga, after cutting the extreme Andes chain, with an altitude of only 1,400 to 1,800 meters and with wooded eastern slopes.

From 6° 30′ to 8° the phytogeographic conditions of the Huallaga Valley are little known. In the valley of the Río Huayabamba, which flows into the Huallaga near Pachiza, grass steppes are said to exist where formerly the village of Pajatén stood (reported by engineer Mariano Tarnawiecki). With the Huayabamba unites the Apisoncho, along which I descended to an altitude of 2,200 meters, nearly to Jucusbamba. From here I could still overlook a lower part of the valley and observe that the grass steppes were entirely wanting and that the ceja woods touched the tropical rain forest. From 8° to 9° 40′ the left-hand lateral valleys of the Huallaga

in the upper part of the montaña are characterized by an alternation of evergreen grass steppes and evergreen subxerophytic bushwoods, while farther down tropical rain forest and matorral accompany the Huallaga and its tributaries.

The scene is similar at about 10° in several valleys of the Palcazu system. Here, also, subxerophytic grass steppes and bushwoods lie between the ceja woods and tropical forest land.

The formations are distributed otherwise at the Perené, about 11°, where the tropical rain forest is more extensive and approaches more closely the main ranges of the Andes. The subxerophytic grass steppes and bushwoods appear as scattered and mostly small patches. They are of greater extent only in the far east, in the so-called Gran Pajonal, surrounded by the Perené, Ucayali, and Pachitea. At the Pangoa, a right-hand tributary of the Perené, subxerophytic vegetation is absent, and the montaña consists only of tropical rain forest and the matorral of the river banks.

In the narrow valley of the Mantaro, which is enclosed between high and steep walls, there is, below the mouth of the San Bernardo, a region of rainy-green savannas, as yet little explored. The Mantaro enters the tropical forest land only a short distance before its junction with the Apurímac.

Between 12° and 13°, in the valley system of the Apurímac, the formations again are arranged much like those of the middle Huallaga. In the left-hand lateral valleys subxerophytic grass steppes and bushwoods separate the ceja from the tropical rain forest that occupies the lower parts of the valley system, and on the right of the Apurímac reaches up everywhere to the ceja.

At the mouth of the Pampas the Apurímac enters a rainy-green savanna region, and flows through a narrow valley surrounded by high mountains. On the savanna there is first the subxerophytic montaña vegetation, then the tropical rain forest.

The rainy-green savannas and savanna bushwoods have their greatest extension at the Urubamba and Yanatili. Upward this vegetation passes into the ceja by partly rainy-green, partly evergreen formations, now woods, now grass steppes. In the ceja often there are patches of grass steppe, especially in the valley of Lares. At the lower end of the savanna region the connection with the tropical rain forest probably is made by the subxerophytic montaña vegetation. A little below Rosalina, at about 600 meters, the grass steppes disappear (according to Bowman, The Andes of southern Peru, New York, 1916, p. 81).

The vegetation conditions of the montaña in the valley of the Río Paucartambo have not yet been investigated, and they can be judged only by inference. Between 13° 8′ and 13°, north of the town of Paucartambo, the Andes fall steeply from an elevation of 3,800 meters toward the lowlands of Madre de Dios. Below the woody formations of the ceja lies tropical rain forest.

Descending into the valley of the Marcapata one comes from the ceja, where wood formations alternate with grass steppes, into the analogous subxerophytic montaña formations, which reach from 2,000 meters down to 1,500 meters, and then into tropical rain forest. The Sandía Valley is similar, but its climate is drier, and its vegetation more dependent upon the change of seasons. Between 2,000 and 1,500 meters the grass steppe is extensive, and the woods occur only in small patches. The Sandía Valley, draining northward toward the upper Inambari, which flows between the front ranges of the Andes, has a very moist climate. The vegetation consists of ceja woody formations and tropical rain forest.

The xerophyte formations of the montaña, that is, the savanna and the savanna bushwood, are clearly dependent on the climate of the regions in which they grow, these being without rain three months or longer. It is difficult to account for the ecology of the evergreen, subxerophytic grass steppes and wood formations. They thrive on different soils, clay as well as sandy. They receive quantities of rainfall which are, indeed, less in some seasons than in others, but yet always sufficient for the existence of tropical rain forest. This is especially evident where the subxerophytic formations occur as small islands, within tropical rain forest, as happens at the Perené.

Why are there in some places other formations instead of the tropical rain forest? Interference by man is unimportant, because these regions generally are uninhabited or have only a sparse population. Furthermore, one finds that in eastern Peru after the destruction of the forest, new forest grows again if the destructive influences cease. This is demonstrated by abandoned plantations and places denuded by landslides. Probably grass steppes and low bushwood can grow on a soil not fertile enough to support tall forest. Whether there is bushwood or grass steppe likewise seems to depend on the fertility of the soil. The bushwood often grows in depressions, places where nutritive material accumulates. The soil covered by the grass steppe may be the poorest. This seems probable because of the small number of species belonging to this formation; also

because of the custom of the people to clear woodland for plantations, but not to utilize grass steppe, in spite of its being easier to cultivate.

It is also a strange phenomenon that, notwithstanding the copious rains throughout the year, so many plants, particularly those of grass fields and low bushwoods, possess adaptations for protection against desiccation. This can be explained by the fact that in the low formations the soil dries more easily than in tall forest. In the former a few hours of tropical sunshine may be enough to cause scarcity of water.

Floristic investigations lead to the hypothesis that climatic changes have been the primary causes of the present multiplicity of formations. It has been stated already that in the subxerophytic formations as well as in the savannas and savanna bushwoods there are found elements that have come from distant dry regions of the east, especially central Brazil. Such plants can not migrate in the tall rain forest that now covers the plains of Amazonia. Their route must have been through xerophytic or subxerophytic vegetation; the forest formerly must have been less extensive than now.

SYSTEMATIC LIST OF GENERA AND SPECIES

1. CYCADACEAE. Cycad Family

This family, interesting as comprising the few living relatives of a group which in Mesozoic time spread over the world, is represented in Peru by only the following genus.

1. ZAMIA L.

Short stocky plants, stemless or with a low trunk-like caudex. Leaves developing singly, pinnate, evergreen, the leaflets thickened and jointed at base, parallel-veined. Sporophylls peltate, in compact strobiles. Dioecious.

Petiole prickly.

Leaflets many (about 40) ..... *Z. Lindenii.*

Leaflets few (about 10) ..... *Z. Ulei.*

Petioles unarmed ..... *Z. Poeppigiana.*

Zamia Lindenii Regel ex André, Ill. Hort. 22: 23. *pl. 195.* 1875.

Stems cylindrical, 1–2.5 m. high and 1–2.5 dm. thick; petioles long, cylindrical, sparsely tawny-woolly, with short conical spreading prickles; leaflets 20 pairs, or even more, glabrous or puberulent,

nearly or exactly opposite, lanceolate, acuminate, dentate-serrate above.

San Martín: Tarapoto (according to Ule).—Loreto: Iquitos, edge of forest, *Williams 3794* (determination somewhat doubtful). Ecuador. "Palma de goma" (Ecuador).

Zamia Poeppigiana Mart. & Eichl. in Mart. Fl. Bras. 4, pt. 1: 414. *pl. 109*. 1863.

Caudex prostrate, rooting; petioles unarmed, angled, glabrous; leaflets 12–14 pairs, about 1.5–3 dm. long and 2–4 cm. broad, falcate-lanceolate, attenuate, above the middle remotely serrulate; male cones about 1 dm. long, 1.5 cm. thick; female unknown.

San Martín: Tocache (*Poeppig*).—Loreto: Puerto Arturo, in forest, *Williams 5373* (determination uncertain).

Zamia Ulei Damm. Verh. Bot. Ver. Brandenb. 48: 117. 1907.

A stemless plant with large, broadly ovate leaves; petioles about a meter long, densely aculeate; leaf segments 5–8 (or more) on each side of the (3–5 dm. long or longer) rachis, subopposite, 4–5 cm. distant, subfalcate, contracted toward the base, acute, shortly 12–15-dentate, about 5 dm. long and 6 cm. wide; cone (fem.) cylindrical, about 2 dm. long and 6 cm. thick; scales in 9–15 series, 12 by 22 mm., fuscous-pilose; seeds ovoid-oblong, subtrigonous.—Ducke has described the male cone as 6–10 cm. long, 1.5 cm. thick, on a peduncle 6–8 cm. long.

Loreto: Leticia and Yurimaguas (according to Ule). San Antonio, *Ule*.—San Martín: Tarapoto (according to Ule). On the Huallaga at Shapaga (according to Ule). Brazil.

2. TAXACEAE. Yew Family

Reference: Pilger, Pflanzenr. IV. 5. 1903.

The representation of coniferous trees in Peru is limited to this family and to the following genus. *Araucaria* (*A. excelsa* according to Weberbauer, 299) is sometimes cultivated along the coast. There are some fine trees at Chosica near Lima.

1. PODOCARPUS L'Hér.

The Peruvian species are very densely branched and compact trees or tall shrubs with many rigid, linear-lanceolate, subopposite or usually spiraled leaves, suberect or more frequently widely spreading in a plane. Flowers dioecious; fruit thick, drupe-like, 1-ovuled.

Receptacle, if present, fleshy.—They simulate no other Peruvian trees in aspect but recall the related *Taxus* and *Torreya* of other lands to those who know those genera.

Leaves about 1–2.5 cm. long, mostly spreading.

Leaves lanceolate or ovate-lanceolate, broadest below the middle, 3–3.5 mm. wide, 10 mm. long..... *P. Rospigliosii.*

Leaves linear-oblong, narrowed or oblique below, broadest above the middle, scarcely 2 mm. wide or, if wider, 1.5–2.5 cm. long.

Leaf nerve impressed above..... *P. montanus.*

Leaf nerve raised above.

Leaves 6–10 mm. long..... *P. utilior.*

Leaves 1.5–2.5 cm. long..... *P. Harmsianus.*

Leaves 3–7 cm. long, or sometimes shorter but suberect.

Leaves 3–4 mm. broad; male flowers several..... *P. glomeratus.*

Leaves 6–10 mm. broad; male flowers solitary..... *P. oleifolius.*

Podocarpus glomeratus Don in Lamb. Pin. 2: 21. 1824; 86.

Sometimes 12 m. high but often lower, very leafy and compactly branched; leaves suberect, rigid, acute or pungent, narrowed at base, subsessile; male flowers fasciculate; female flowers solitary on peduncles 2–5 mm. long; seed 5 mm. long, subglobose, scarcely apiculate.—There are a few evidently very old trees still growing near the hill-top village of Panao. They are distinctive in appearance, standing alone or in small groups on the open slopes. Neg. 11573.

Huánuco: Panao, *Ruiz 3630; Raimondi.*—Junín: Rocchac, 2,600 m., *Weberbauer 6586* (det. Pilger). Ecuador. "Huampo."

Podocarpus Harmsianus Pilger, Pflanzenr. IV. 5: 68. 1903.

A shrub or small tree, probably (female flowers unknown) nearest *P. montanus* but the leaf nerve not at all impressed; leaves in a plane, 3–4 mm. wide, somewhat pruinose beneath; male spikes about 15-flowered. Neg. 11574.

Ayacucho: Carrapa, 1,000 m., *Killip & Smith 22480* (det. Pilger).—Cajamarca: Prov. Jaen, *Raimondi* (det. Pilger). Colombia; Venezuela.

Podocarpus montanus (Willd.) Lodd. Cat. 37. 1836; 67. *Taxus montana* Willd. Sp. Pl. 4, pt. 2: 857. 1805.

Leaves very widely spreading in a plane, 2.5–3.5 mm. broad; male flowers spicate, numerous; female flowers on short thick branchlets;

receptacle none; seed ovate-globose, apiculate, 1 cm. long, violet-black.—Probably will be found in Peru; *Killip & Smith 22480* (cf. *P. Harmsianus*) has been referred here by Rehder. Neg. 11575.

Ecuador: On Mt. Suraguru, *Humboldt.* Colombia to Central America.

Podocarpus oleifolius Don in Lamb. Pin. 2: 20. 1824; 87.

Similar to *P. glomeratus* but readily known by its larger, rigid but more foliose leaves often 4 cm. long or longer; female peduncles 5–10 mm. long; seed globose-ovoid, distinctly cusped, 7–8 mm. long.—It has the widest distribution of any of our species and is valued highly for its wood. The trunk is sometimes a meter in diameter. 47. Neg. 11576.

Huánuco: Pillao (*Pavón*). Monzón, 2,000 m., *Weberbauer 3538* (det. Pilger).—Puno: Tatanara (*Lechler 2574*).—Cajamarca: Chugur, 2,800 m., *Weberbauer 4090* (det. Pilger); 258. Nanchó, *Raimondi* (det. Pilger). Bolivia to Central America. "Saucecillo."

Podocarpus Rospigliosii Pilger, Notizbl. Bot. Gart. Berlin 8: 273. 1923.

Leaves 8–13 mm. long, 2.5–4 mm. wide, narrowed to an obtusish tip, contracted at the base, barely petioled, glaucescent and, especially above, white-puncticulate, subopposite, biseriate, widely spreading; male flowers aggregate at the ends of short axillary peduncles; female unknown.—Named for Dr. C. J. Rospigliosi of the Museum of Natural History, University of Lima. Neg. 11579.

Peru: Oxapampa, *Esposto 556*. Colombia and Venezuela.

Podocarpus utilior Pilger, Repert. Nov. Spec. 1: 189. 1905.

Resembles most, among our species, *P. montanus*, but the shorter leaves green and not distinctly impressed above medially; male flowers unknown.—A stately tree, 20 m. high, the wood valuable. Neg. 11580.

Junín: Yananga, east of Huacapistana, 2,100 m., *Weberbauer 2114;* 74. *Esposto.* "Uncumanu."

3. EPHEDRACEAE. Joint-fir Family

This family is noteworthy as furnishing the famous Chinese drug, "ma huang" (*Ephedra sinica* Stapf and other species). The Peruvian ones have a local reputation as a remedy for venereal ailments.—See Univ. Calif. Bot. 14: 247-282. 1928 (Groff & Clarke) for a resume

to that year of the accumulated knowledge regarding the drug ephedrine, which probably is present in the Peruvian species.

1. EPHEDRA (Tourn.) L.

Reference: Stapf, Die Arten der Gattung Ephedra, Denkschr. Math. Nat. Cl. K. Akad. Wiss. Wien, 56, pt. 2. 1889.

Low shrubs, with opposite or verticillate branches and opposite, scale-like or linear leaves, often reduced to a more or less connate sheath. Flowers dioecious or rarely monoecious.—Plants often distorted and depressed or sprawling; less frequently erect with strict branches. "Pinco-pinco."

Ephedra americana H. & B. ex Willd. Sp. Pl. 4, pt. 2: 860. 1806. *E. americana* H. & B. var. *Humboldtii* Stapf, op. cit. 85. *E. andina* Poepp. ex Endl. Syn. Conif. 255. 1847.

Branches strict, erect; leaves more or less developed, the lower sheaths biparted; aments typically peduncled but usually sessile or subsessile; bracts 5–7 or, in the apparently intergrading var. *andina* (Poepp.) Stapf, the female only 2–4, red or white, more or less fleshy; seeds included (typically) or exserted.—There has been much disagreement as to the treatment of this plant, and recent authors have been inclined to recognize several species. But Stapf, op, cit., seems to be the only student who has considered all the characters, and until someone proves that these are constant rather than inconstant, as considered by him, his treatment seems to be most satisfactory. Certainly, from casual observation, there is only one variable species. Best marked in habit is the var. *rupestris*. Negs. 11245, 11246.

Amazonas: Chachapoyas, *Mathews 1838*.—Arequipa: Tiabaya, 2,100 m., *Pennell 13077*.—Cuzco: Vilcanota, 3,400 m., *Pennell 14192*. Saxaihuamán, 3,600 m., *Herrera 216*. Reg. Huasao, 3,200 m., *Herrera 3024*. Pampa de Anta, 3,400 m. (*Herrera 633*).—Huánuco: (*Ruiz*). Chalgin, *Sawada 50*. Huánuco, *Kanehira 222, 59*. Below Chavanillo, 2,250 m., *2303*.—Junín: Yanahuanca, 3,000 m., *1243*.—Lima: Matucana, 2,400 m., *2925, 248*.—Puno: Altos de Toledo, 4,900 m., *Meyen* (type of *E. andina*). Ecuador to Patagonia. "Cola de caballo," "pfiuco," "pfirco."

Ephedra americana var. **rupestris** (Benth.) Stapf, op. cit. 86. 1889. *E. rupestris* Benth. Pl. Hartw. 253. 1846. *E. humilis* Wedd. Ann. Sci. Nat. III. 13: 251. 1850. *E. andina* Poepp., var. *humilis* Parl. in DC. Prodr. 16, pt. 2: 353. 1868.

Often very low and depressed or even prostrate, and often with many fasciculate-verticillate "aerial" branchlets; leaves more or less reduced to sheaths; seeds included or exserted (*E. humilis*).—Generally of middle to high elevations, it has recently been found on the costal plain sands, according to Bruns, Mitt. Inst. Allgem. Bot. Hamb. 8: 33. 1929.—Illustrated, Weberbauer, 208.

Cuzco: La Raya, 4,200 m., *Pennell 13487*. Valle de Paucartambo, 4,200 m., *Herrera 2184*.—Arequipa: Mejía (*Günther & Buchtien 392*).—Lima: Río Blanco, 3,600 m., *752*. Chicla (*Ball*).—Puno: Near Lake Titicaca (*Weddell 4385*).

4. GNETACEAE. Gnetum Family

Omitting the Ephedraceae, frequently included, this family contains only *Gnetum*, a group heretofore not known within perhaps a thousand kilometers of Peru. The collection by Williams of two species as recently as 1929 is therefore indicative of the meagerness of knowledge of the Amazonian flora.

1. GNETUM L.

Lianas or shrubs, unmistakable because of the heavy-coriaceous opposite leaves, nodose or jointed branches, and verticillate flowers, the verticels more or less remote, the inflorescence appearing articulated.—The following determinations are by Markgraf.

Gnetum Leyboldii Tul. Ann. Sci. Nat. IV. 10: 115. 1858.

Leaves broadly elliptic or subrotund, about 1.5 dm. long by nearly 1 dm. wide, bluntly acute, the veins prominent and the veinlets very evident beneath; petioles stout, deeply grooved, about 8 mm. long; inflorescence paniculate, the verticels crowded.

Loreto: Manfinfa, Upper Río Nanay, *Williams 1084*. Brazil. "Shicshi-huaiu."

Gnetum nodiflorum Brongn. in Duperr. Itin. 1: 12. 1829; ex Tul. op. cit. 118.

Similar, but the shortly acuminate leaves rather obscurely to very obscurely veined, the subterete petioles about 1 cm. long and the verticels distant (to about 1 cm., at least in fruit).—According to Killip and Smith, a tree 8–10 m. high.

Loreto: Lower Río Nanay, *Williams 691*. Mishuyacu, *Killip & Smith 24938*. Brazil; Guianas.

5. TYPHACEAE. Cat-tail Family

Reference: Pflanzenr. IV. 8. 1900.

1. TYPHA (Tourn.) L.

The distribution of this well-known plant in Peru is, apparently, surprisingly local, and it was never observed by me. *T. latifolia* L., with the female flowers ebracteolate and contiguous with the male, does not seem to have been recorded.

Typha angustifolia L. Sp. Pl. 971. 1753. *T. domingensis* Kunth, Enum. Pl. 3: 92. 1841.

Female flowers bracteolate; spikes often discontinuous.—Urban regards *T. domingensis* as distinct.

Arequipa: Vitoc Valley below 1,100 m. (Weberbauer, 129).—Lima: Vicinity of Barranco and Miraflores (Weberbauer, 149).—Piura: In the loma zone (Weberbauer, 150). Generally distributed in tropical and temperate regions.

6. POTAMOGETONACEAE. Pondweed Family

Flowers in 2–many-flowered spikes; stigma sessile or subsessile, small; leaves 3-nerved (ours), or the inflorescence pseudo-umbellate.

Spikes cylindrical, the flowers several; carpels sessile. 1. *Potamogeton.*

Spikes 2-flowered; carpels maturing pedicellate . . . . . 2. *Ruppia.*

Flowers solitary; stigma peltate; leaves filiform-linear. 3. *Zannichellia.*

1. POTAMOGETON [Tourn.] L.

Reference: Hagström, Crit. Res. Pot. 1916.

Annual or perennial aquatics with generally nerved leaves, all submerged or all floating, often broader than linear. Spikes mostly emersed. Stamens 4.—Besides the following, *P. sclerocarpus* Schum. with oblong-lanceolate floating leaves, and possibly similar species, may, of course, be expected.

Potamogeton Aschersonii A. Benn. Journ. Bot. 31: 294. 1893; 111.

Stems slender, terete, 1–3 dm. long, branched; leaves not clearly cross-veined, 3-nerved, 2.5–7 cm. long, 1.5–3 mm. broad, obtuse with a cusp; stipules tardily deciduous, 12–18 mm. long, yellowish;

peduncles equal, 4–6 cm. long; spikes 8–12 mm. long; fruit 4.5 mm. long, broad, ovate or subovate, the ventral margin acutely 3-carinate.—*P. Berteroanus* Phil., similar, has 5–7-nerved leaves.

Lima: Callao (*D'Orbigny*). Lima, *Weberbauer 5234*. Chile to Brazil; eastern North America.

Potomogeton nodosus Poir. in Lam. Encyc. Suppl. 4: 535. 1816. *P. fluitans* Auth.

Floating leaves oblong-elliptic, the blades 6–8 cm. long and about 2.5 cm. broad, barely acute, shortly attenuate at base, the petioles as long or longer; submerged leaves linear, soon disappearing; fruits large, conspicuously keeled dorsally.—The name accepted is in accord with Hagström's interpretation. Our material is sterile, but seems referable here.

Junín: Near Huancayo, 3,300 m., *Killip & Smith 22037*. Temperate and subtropical regions of both hemispheres.

Potamogeton striatus R. & P. Fl. 1: 70. *pl. 106*. 1798.

Stems elongate, striate, the internodes 3–6 cm. to much longer; leaves 1.5–3 mm. broad, or broader, plane, 3–12 cm. long, vaginate at base for often 1–2 cm.; spikes 1.5 cm. long; fruit 3 mm. long, 2 mm. wide.—Hagström treats this as *P. pectinatus* L., var. *striatus* (R. & P.) Hagstr., regarding it "as a broad-leaved, small-fruited South American race." *P. pectinatus* L., with 1-nerved leaves, may be represented by a collection from Altos de Toledo, Puno, by Meyen. *P. strictus* Phil. has narrower concave thick leaves.

Lima: Chancai and Lurín (*Ruiz & Pavón*; *Dombey*). Chile; Brazil.

2. RUPPIA L.

Reference: Ascherson and Graebner, Pflanzenr. IV. 11. 1907.

A submerged herb, usually of saline or partially salty water, with filiform leaves, more or less broadly vaginate, and finally long-pediceled fruits. Stamens 2.

Ruppia maritima L. Sp. Pl. 127. 1753; 142.

Two forms occur: The typical with more or less contorted peduncles elongating in fruit, and var. *rostrata* Agardh, with straight, not at all elongate peduncles.—Illustrated, Pflanzenr. IV. 11: 143. Hagström, Bot. Not. 137. 1911, considers *R. maritima* an aggregate.

Puno: Lake Titicaca, *Mandon*.—Junín; In flowing water, Tarma, *Killip & Smith 21916* (sterile; det. generically by Graebner; possibly

R. obtusa Hagstr. op. cit. 140).—Piura: Pariñas Valley, *Haught F45*. Occurring around the world.

3. ZANNICHELLIA [Micheli] L.

A filiform-leaved aquatic with sessile or peduncled, monoecious flowers at the base of the leaves. Carpels usually about 4, strongly oblique, with a crenate margin in the Peruvian species.

Zannichellia palustris L. Sp. Pl. 969. 1753; 153.

Leaves 1–10 cm. long, rarely 2 mm. broad; carpels congested, 2 mm. long.—Illustrated, Pflanzenr. IV. 11: 154.

Cuzco: Valle de Oropeza, Huambutío, 3,100 m., *Herrera 2083*.—Arequipa: *Weberbauer 1436* (det. Graebner); 129.—Huánuco: Huánuco, 2,100 m., *3499*.—Lima: Callao, *5878*. Generally distributed except in Australia.

7. NAIADACEAE

Reference: Rendle, Pflanzenr. IV. 12. 1901.

1. NAIAS L.

Submerged annuals of fresh or subsaline water. Leaves sessile, linear, sinuate-dentate or serrulate. Flowers solitary or few at the base of the branches and in the short leaf sheaths. Most likely to occur in Peru are the following:

Naias arguta HBK. Nov. Gen. & Sp. 1: 371. 1816.

Dichotomously branched, the ultimate branches crowded; leaves more than 1 mm. broad, distinctly denticulate, recurved, not at all punctate; anthers 4-celled; fruit 2.5 mm. long, fusiform, with many elongate reticulations.—Illustrated, Pflanzenr. IV. 12: 11.

Peru: Probably occurring. Colombia, Ecuador, and Brazil.

Naias guadalupensis (Spreng.) Morong, Mem. Torrey Club 3: 60. 1893. *Caulina guadalupensis* Spreng. Syst. 1: 20. 1825.

Very slender, diffusely branched; leaves 1–2.5 cm. long, very minutely spinulose on the margins, spreading; fruit narrowly ellipsoid, about 2 mm. long, with 18–20 reticulations in each row.—*N. Podostemon* Magnus, from the Amazon, has 2-celled anthers.—Both species illustrated, Mart. Fl. Bras. 3, pt. 3: *pl. 124, 123*.

Peru: Probably occurring. North America to Uruguay.

8. SCHEUCHZERIACEAE

Reference: Buchenau, Pflanzenr. IV. 14. 1903.

Perianth present; inflorescence linear.....1. *Triglochin.*
Perianth none; inflorescence ovate.....2. *Lilaea.*

1. TRIGLOCHIN L.

Slender or stout and tall, rush-like, shore plants, with a narrow, rather remotely-flowered, racemose inflorescence. Flowers hermaphrodite, the parts in sixes or the stamens fewer by abortion, the carpels often not all fertile.

Stout, rhizomatous but not stoloniferous; carpels all fertile.
T. maritima.

Slender, stoloniferous; fertile carpels 3.

Stolons fugacious, bulblet-bearing; fruits nearly linear.
T. palustris.

Stolons persistent, not bulbous; fruits globose.....*T. striata.*

Triglochin maritima L. Sp. Pl. 339. 1753.

Usually several dm. high, the stout stems clothed below with the old leaf sheaths; leaf shorter than the stem, to 4 mm. broad, semiterete; ligule 5–7 mm. long.

Peru: Possibly occurring. Saline shores everywhere except in the arctic and tropical zones.

Triglochin palustris L. Sp. Pl. 338. 1753.

Stems slender, often only 1–2 dm. high; ligule short, auriculate; fruit appressed, 7–8 mm. long.

Peru: Probably occurring. Temperate regions.

Triglochin striata R. & P. Fl. 3: 72. 1802.

Very variable vegetatively and from a few cm. to many dm. high, but always distinguishable easily by the small flowers, 1.5–2 mm. long, and the roundish fruit.—*T. ciliata* R. & P., loc. cit., was not identified by Buchenau, who remarked "species inextricabilis."

Lima: Surco, Miraflores, and vicinity (*Ruiz & Pavón*); *Lesson; Dombey.* Temperate Africa; Australia and South America.

2. LILAEA H. & B.

A somewhat tufted perennial of wet places with nearly terete leaves sheathed at base and longer than the scapose stems. Spikes

thickish, with pistillate flowers below, hermaphrodite in the middle, and staminate above.

Lilaea subulata H. & B. Pl. Aequin. 1: 222. *pl. 63.* 1808.

Plants 1–3 dm. high, somewhat fleshy, especially below; fruit ovate-linear, partly long- and partly short-styled.—Weberbauer found the plant between cushions of *Distichia,* where water stands or collects.—Illustrated, Pflanzenr. IV. 14: 18.

Puno: At 4,200 m., *Weberbauer 1010* (det. Graebner); 219.—Arequipa: *Meyen.* Central America to Chile and Uruguay.

9. ALISMACEAE. Water-plantain Family

Reference: Buchenau, Pflanzenr. IV. 15. 1903.

Plants with erect emersed leaves, at least in part.

Stamens 6; carpels forming a wheel-shaped fruit.....4. *Alisma.*

Stamens 9–many; carpels in a roundish head.

Flowers hermaphrodite; carpels little compressed, costate, often glandular.....1. *Echinodorus.*

Flowers nearly always monoecious; carpels flat, scarcely costate, more or less winged, eglandular.....3. *Sagittaria.*

Plants submerged, with floating leaves.....2. *Lophotocarpus.*

1. ECHINODORUS L. C. Rich.

Aquatic perennials or rarely annuals, with ovate, lanceolate, or rarely narrower leaves, and white, umbellate-racemose, hermaphrodite, paniculate flowers. Submersed leaves, if any, often linear. Sepals green, striate, recurved in fruit. Petals larger. Stamens 6–many. Fruit mostly spherical or ovate.

Stamens 9–12; inflorescence umbellate or racemose; carpels 7–9-costate.

Small plants with leaves 5–12 cm. long.....*E. tenellus.*

Medium-sized plants, the leaves 1–3 cm. long.

Primary nerves all from the base of the leaf.....*E. subulatus.*

Primary nerves not all from the base.....*E. intermedius.*

Stamens 12–many; inflorescence more or less paniculate; carpels 6–8-costate.

Leaves lanceolate, decurrent to the petiole.....*E. paniculatus.*

Leaves ovate, more or less rounded-truncate or cordate at base.

Leaves without pellucid lines or dots.....*E. macrophyllus.*

Leaves with pellucid lines or dots.
Leaves mostly punctate.....*E. grandiflorus.*
Leaves mostly lineate.....*E. palaefolius.*

Echinodorus grandiflorus (C. & S.) Micheli in DC. Monogr. 3: 57. 1881; 33. *Alisma grandiflorum* C. & S. Linnaea 2: 152. 1827.

A meter or higher, with large ovate leaves 1–4 dm. long and to 3.5 dm. broad, and an ample inflorescence; flowers 2.5 cm. broad, the petals 3–4 times longer than the obtuse sepals; carpels 2–4-glandular, very numerous, forming a globose, shortly echinate fruit.—Illustrated, Bettfreund, Fl. Argent. 1: *pl. 34.* Neg. 11567.

Peru: *Pavón.* Brazil to Patagonia.

Echinodorus intermedius (Mart.) Griseb. Cat. Pl. Cub. 218. 1866; 30. *Alisma intermedium* Mart. ex R. & S. Syst. 7, pt. 2: 1609. 1830.

Slender, with 3–7-plinerved, very thin leaves, the veins and pellucid dots prominent; leaves often somewhat cordate at base but attenuate to the very long petioles, the shorter blades mostly 6–10 cm. long and 2–3 cm. wide; inflorescence racemose, slender; flowers small; carpels 6–8-costate, with 1–3 lateral glands.—Grisebach's plant is *E. Martii* Micheli, a species with narrowly oblong, coriaceous leaves. It is to be expected in Peru.

Loreto: Middle Río Blanco, *Tessman 3044.* Yurimaguas, *Killip & Smith 28041.* Brazil.

Echinodorus macrophyllus (Kunth) Micheli in DC. Monogr. 3: 50. 1881; 32. *Alisma macrophyllum* Kunth, Enum. Pl. 3: 151. 1841.

Very similar to *E. grandiflorus* except for the absence of pellucid lines or dots. Neg. 11569.

Peru: Probably occurring. Ecuador to Brazil.

Echinodorus palaefolius (Nees & Mart.) Macbr. Field Mus. Bot. 11: 4. 1931. *Sagittaria palaefolia* Nees & Mart. Nov. Act. Acad. Nat. Cur. 11: 21. 1823. *Alisma ellipticum* Mart. in R. & S. Syst. 7, pt. 2: 1607. 1830. *E. ellipticus* Micheli in DC. Monogr. 3: 51. 1881.

Tall; leaves 1–2 dm. long and 1–1.5 dm. broad; inflorescence racemose or paniculate, sometimes scabrous-pubescent var. *pubescens* (Mart.) Micheli; petals longer than the sepals; carpels with

a solitary gland.—Illustrated (as *Alisma*), Mart. Fl. Bras. 3, pt. 1: *pl. 13.*

Peru: Probably occurring. Mexico to Uruguay.

Echinodorus paniculatus Micheli in DC. Monogr. 3: 51. 1881; 32.

Tall, a meter high, without pellucid lines or dots; leaves 4–8 dm. long, 3–7-nerved; sepals erect and enlarged after anthesis; petals three times longer; fruit 5 mm. in diameter, the scarcely compressed, obovate-cuneate carpels uniglandular or eglandular.—Flowers illustrated, Usteri, Fl. São Paulo 140. 1911.

San Martín: Río Huallaga, *Williams 5815.* Ecuador to Brazil and Paraguay.

Echinodorus subalatus (Mart.) Griseb. Cat. Pl. Cub. 218. 1866; 29. *Alisma subalatum* Mart. in R. & S. Syst. 7, pt. 2: 1609. 1830.

About 3 dm. high, or higher, with lanceolate-ovate acute leaves acute at base, mostly longer than the petiole or 1–2 dm. long, 5–9-nerved; inflorescence mostly verticillate-racemose; bracts connate at base; peduncles 5–7 mm. long, deflexing; carpels with 1 lateral gland.

Peru: Probably occurring. Guianas to Brazil.

Echinodorus tenellus (Mart.) Buchenau, Abh. Nat. Ver. Brem. 2: 21, 38. 1868; 27. *Alisma tenellum* Mart. in R. & S. Syst. 7, pt.2: 1600. 1830.

Annual or more enduring, from a few cm. to 2 dm. high; leaves linear to ovate, destitute of pellucid lines; inflorescence mostly umbellate; peduncles 0.5–2.5 cm. long, often recurving; petals a few mm. long; carpels small, 8-ribbed, lateral glands none.—Often a little tufted plant.—Illustrated, Pflanzenr. IV. 15: 25.

San Martín: Tarapoto, *Spruce 4491.*—Loreto: Lower Río Huallaga, *Williams 4698.* South America and eastern North America.

2. LOPHOTOCARPUS Durand

An aquatic with long-petioled, deeply cordate, roundish, floating leaves and white, shortly peduncled flowers raised above the water. Flowers hermaphrodite and male.

Lophotocarpus guyanensis (HBK.) J. G. Smith, Rept. Mo. Bot. Gard. 6: 61. 1894; 35. *Sagittaria guayanensis* HBK. Nov. Gen. & Sp. 1: 250. 1816.

Stout, with large leaves; carpels triangular-cuneate, about 2 mm. long, with shallowly and irregularly lobed margins or, in var. *echinocarpus* (Mart.) Buchenau, also laterally aculeate.

San Martín: Tarapoto, *Ule 6595* (det. Graebner). Central America to Brazil.

3. SAGITTARIA L. Arrow-head

This well-known group of perennials of shallow waters, with often arrow-shaped, mostly emersed leaves, is characterized especially by its mostly monoecious flowers, usually numerous stamens, and rather simply paniculate or racemose inflorescence.

Sagittaria montevidensis C. & S. Linnaea 2: 156. 1827; 43.

Stout plants with sagittate leaves, large, yellow or yellow-spathed flowers, and subulate filaments, scabrous below.—*S. lancifolia* L., with lanceolate leaves and white flowers, may occur. Neg. 11571.

Lima: *Ruiz; (Dombey)*.—Piura: (Weberbauer, 149).—San Martín: Moyobamba (Weberbauer, 292).—Loreto: Mishuyacu, *Klug 763*. Brazil; Argentina.

4. ALISMA L.

No certain record of the well-known *Alisma Plantago-aquatica* L. has been noted.

Peru: Possibly occurring. Temperate regions of both hemispheres.

10. BUTOMACEAE

Reference: Buchenau, Pflanzenr. IV. 16. 1903.

Leaves not at all cordate.....1. *Limnocharis.*
Leaves deeply and narrowly cordate at base.....2. *Hydrocleis.*

1. LIMNOCHARIS Humb. & Bonpl.

Fleshy perennials with long petioles, broadly vaginate below, mostly basal, ovate to lanceolate leaves, and solitary terminal umbels of 2–12 yellow hermaphrodite flowers. Carpels verticillate, semicircular, flat, sulcate on the outer edge.—*L. Haenkei* Presl, Rel. Haenk. 1: 88. 1827, has been identified as *Heliconia hirsuta* L. f.

Limnocharis flava (L.) Buchenau, Abh. Nat. Ver. Brem. 2: 2. 1868; 9. *Alisma flavum* L. Sp. Pl. 343. 1753.

About 2–4 dm. high; pedicels 3–4 cm. long; flowers 1.5 cm. wide, the broad petals exceeding the obtuse sepals.—Illustrated, Pflanzenr. IV. 16: 8.

San Martín: Tarapoto, *Spruce 3872* (det. Buchenau); *Williams 6505, 5654*.—Loreto: Mainas (*Poeppig 2080*). Yurimaguas, *Williams 7859*. West Indies to Brazil; Ecuador.

2. HYDROCLEIS L. C. Rich.

Procumbent, or in water the rotund-cordate leaves floating, rooting at the nodes. Flowers many, in fascicles. Carpels only 6, attenuate to the style.

Hydrocleis nymphoides (Willd.) Buchenau, Pflanzenr. IV. 16: 10. 1903. *Stratiotes nymphoides* Willd. Sp. Pl. 4: 821. 1806.

Petals nearly orbicular, 4–5 cm. broad.—Illustrated, Pflanzenr. IV. 16: 10; Bailey, Stand. Cycl. 1624.

Peru (*Pavón*). Ecuador to Venezuela and Brazil.

11. HYDROCHARITACEAE

These completely submerged water plants may be represented also by *Hydromystria stolonifera* G. F. W. Mey. It has basal, petioled, ovate or roundish leaves, and flowers (with linear petals) enclosed in a spathe.—Illustrated, Mönkemeyer, Sumpf. Wasserpfl. 55.

1. ELODEA Michx.

This widely distributed aquatic with rather crowded and short, opposite or whorled, 1-nerved, pellucid leaves, is sometimes treated as constituting a family, Elodeaceae. The staminate flowers (ours with petals) are usually solitary and pediceled from a spathe; the pistillate are sessile.—Brother Marie-Victorin considers the name *Elodea* untenable; the question properly requires international agreement.

Elodea Potamogeton (Bert.) Espinosa, Rev. Chil. Hist. Nat. 31: 150. 1928. *Diplandra Potamogeton* Bert. Merc. Chil. 612. 1829; Bull. Férus. 20: 110. 1830. *Anacharis chilensis* Planch. Ann. Sci. Nat. III. 11:75. 1849. *A. Potamogeton* Vict. Contr. Bot. Montr. 18: 41. 1931. *E. chilensis* Casp. Monatsber. Berl. Acad. 47. 1857. *A. Matthewsii* Planch. op. cit. 73(?).

Leaves crowded in whorls of 3–4, about 1.5 cm. long, 2–4 mm. wide, obtusish, very minutely serrulate; spathe of the sessile female flowers tubular, cleft at apex; styles deeply 2-parted; segments of the male flowers subequal; anthers linear-oblong.

Cuzco: Saxaihuamán, *Herrera 2172*. Huambutío, *Herrera 2082*.—Lima: Ubuamantaga (*Mathews 581*?).—Junín: La Oroya, *Weber-*

bauer 2581 (det. Graebner).—Puno: Azángaro, *Lechler 3144*. Chile. "Luchi," "chchinqui," "chinquil," "unu-chchanqui."

12. TRIURIDACEAE Lindl.

This family of nearly colorless and leafless, saprophytic herbs has apparently been unknown from Peru until recently discovered as indicated by the collection cited below. No other Peruvian plants are similar in aspect except the Burmanniaceae. The three other genera (cf. Mart. Fl. Bras. 3, pt. 3: 646) may also be expected.

1. SCIAPHILA Blume

Stems erect, strict, with remote scale-like leaves. Flowers monoecious. Stamens usually 3 (2, 4, or 6). Fruit dehiscent, capsular.

Sciaphila purpurea Benth. in Hook. Journ. Bot. Misc. 7: 11. 1855.

Very slender, sometimes 3–4 dm. high, with the open racemose inflorescence half as long; pedicels filiform, elongate; perianth divisions greenish purple, 3–4 mm. long, refracted, papillose within, beautifully penicillate-pilose at the tips, the hairs glistening; capsule muriculate apically, the seeds 6–8-costate.—As our material is staminate, specific identity is not positive.

Loreto: In forest, La Victoria on the Amazon, *Williams 2547*. Brazil.

13. GRAMINEAE. Grass Family

By Paul C. Standley

Plants chiefly herbaceous, or rarely woody, with usually hollow stems (culms) closed at the nodes; leaves 2-ranked, consisting of the sheath, which envelops the culm, and the blade, and appendage (ligule) present at the junction of blade and sheath; flowers perfect or rarely unisexual, small, with no distinct perianth, arranged in spikelets consisting of a shortened axis (rachilla) and 2–many 2-ranked bracts; lowest 2 bracts (glumes) empty, rarely one or both of them obsolete, the succeeding bracts (lemmas) bearing in their axils a single flower, and between the flower and the rachilla a second 2-nerved bract (the palea), the lemma, palea, and flower together constituting the floret; stamens 1–6, usually 3; pistil 1, with a 1-celled 1-ovulate ovary and usually 2 styles.

The grasses constitute the most important economic group of plants of the whole world, since they yield such essential food staples as wheat, maize, rice, barley, and rye. The native species of any

region usually are very numerous, in temperate regions constituting ordinarily about ten per cent of the whole number of flowering plants. In Peru grass species are most numerous in the mountain regions, those of the tropical lowlands being comparatively few.

The present treatment of the grasses of Peru is based upon and in large part compiled with comparatively few changes from *The Grasses of Ecuador, Peru, and Bolivia*, by A. S. Hitchcock (Contr. U. S. Nat. Herb. 24, pt. 8. 1927). There is cited here much additional material that has become available since the publication of that paper, besides a large number of species not listed in it for Peru. Most of the additional grasses cited, many of them collected by Field Museum Expeditions, have been determined by Professor A. S. Hitchcock and Mrs. Agnes Chase, but many others have been identified by the present writer.

Series 1. **Poatae**

Spikelets 1–many-flowered, the reduced florets, if any, above the perfect florets (except in *Phalarideae;* 1 or more sterile lemmas below in *Bambuseae);* articulation usually above the glumes.

Plants woody (only slightly so in *Neurolepis*), low or tall shrubs, often clambering, rarely tall trees. Spikelets 1–many-flowered, 1–several sterile lemmas present below the perfect ones. ..... 1. *Bambuseae.*

Plants herbaceous.

Spikelets with 2 staminate, neuter, or rudimentary lemmas unlike and below the fertile lemma; no sterile or rudimentary florets above ..... 8. *Phalarideae.*

Spikelets without sterile lemmas below the perfect floret, or these rarely present and like the fertile ones.

Spikelets unisexual, 1-flowered, the plants monoecious.

Lemma terete; fruit covered with hooked hairs; blades more or less elliptic, broad ..... 68. *Pharus.*

Lemma globular, smooth; blades linear ..... 10. *Zizanieae.*

Spikelets perfect (rarely unisexual, but then not as above), usually jointed above the glumes.

Spikelets jointed below the glumes, 1-flowered, very flat, the lemma and palea subequal, both keeled; glumes small or wanting ..... 9. *Oryzeae.*

Spikelets jointed above the glumes (rarely below, but the glumes, at least one of them, then well developed).

Spikelets 1-flowered, in groups (short spikes) of 2–5, the groups racemose along a main axis, falling entire; lemma and palea thinner than the glumes. 6. *Nazieae.*

Spikelets not as above.

Spikelets sessile on a usually continuous rachis (short-pediceled in *Leptochloa;* rachis disjointing in *Hordeum*).

Spikelets on opposite sides of the rachis; spike single, terminal..... *3. Hordeae.*

Spikelets on one side of the rachis; spikes usually more than one, digitate or racemose..... *7. Chlorideae.*

Spikelets pediceled, in open or contracted, sometimes spikelike panicles.

Spikelets 1-flowered..... *5. Agrostideae.*

Spikelets 2–many-flowered.

Glumes as long as the lowest floret, usually as long as the spikelet; lemmas awned from the back (spikelets awnless in *Dissanthelium;* awn arising between the lobes in *Danthonia*).... *4. Aveneae.*

Glumes shorter than the lowest floret; lemmas awnless or awned from the tip or from a bifid apex. *2. Festuceae.*

Series 2. **Panicatae**

Spikelets with 1 perfect terminal floret (disregarding the few monoecious genera and the staminate and neuter spikelets) and a sterile or staminate floret below, usually represented by a sterile lemma only, one glume (rarely both) sometimes wanting; articulation below the spikelets (except in *Melinideae*), in either the pedicel or the rachis or at the base of a cluster of spikelets, the spikelets falling entire, either singly, in groups, or together with joints of the rachis; spikelets, or at least the fruits, more or less dorsally compressed. (*Panicum quadriglume* has 2 sterile lemmas; *Isachne* has 2 perfect florets.)

Glumes membranaceous; fertile lemma and palea indurate or at least as firm as the glumes; sterile lemma like the glumes in texture.

Fertile lemma and palea scarcely firmer than the glumes; lower floret staminate or neuter, awnless, the perfect floret awned. 11. *Melinideae.*

Fertile lemma and palea indurate or subindurate, usually much firmer than the glumes; perfect floret usually awnless. 12. *Paniceae.*

Glumes indurate; fertile lemma and palea hyaline or membranaceous, the sterile lemma like the fertile one in texture.

Inflorescence not monoecious, the fertile spikelets perfect, each usually paired with a sterile spikelet.....13. *Andropogoneae.*

Inflorescence monoecious, the pistillate spikelets below, the staminate above on the same rachis.....14. *Tripsaceae.*

1. BAMBUSEAE

Stamens 6. Spikelets several-flowered.....2. *Guadua.*

Stamens 3.

Spikelets with more than one perfect floret.

Sterile lemmas none; plants shrubby or arborescent. 3. *Arundinaria.*

Sterile lemmas 1–2; plants high-climbing....1. *Arthrostylidium.*

Spikelets 1-flowered.

Spikelets arranged in a one-sided spike.....5. *Merostachys.*

Spikelets in open or spike-like panicles.

Culms woody; blades jointed at the base, mostly not more than 20 cm. long and 2 cm. wide, commonly much smaller.....4. *Chusquea.*

Culms scarcely woody; blades continuous with the sheath, 30–100 cm. long and more than 2 cm. wide. 6. *Neurolepis.*

2. FESTUCEAE

Lemmas divided at the summit into 9 or more awns or awn-like lobes.

Awns mixed with awned teeth; florets not falling attached, the rachilla disjointing between them; panicles rather open. 22. *Cottea.*

Awns not mixed with awned teeth; all florets falling attached, their awns forming a pappus-like crown, only the lowest floret fertile; panicles narrow.....23. *Pappophorum.*

Lemmas not divided into several lobes, awnless, with a single awn or, if 3, the lateral awns minute.

Plants tall stout reeds (stout bunch grasses in *Cortaderia; C. sericantha* a dwarf plant) with large plume-like panicles;

lemmas or rachilla with long silky hairs as long as the lemmas (staminate spikelets glabrous in *Gynerium*).

Blades crowded at the base of the culms.....16. *Cortaderia.*

Blades distributed along the culms.

Spikelets unisexual, the plants dioecious; culms mostly more than 3 meters high.....17. *Gynerium.*

Spikelets perfect; plants usually about 2 meters high. 15. *Phragmites.*

Plants low or tall, if more than 1 meter high not stout bunch grasses.

Plants dioecious, perennial from creeping stolons. Lemmas glabrous; grasses of salt or alkaline soils....14. *Distichlis.*

Plants not dioecious (except in some species of *Poa*), not as above.

Blades broad, oblong to ovate, with transverse veins between the nerves.

Spikelets 3–5-flowered; glumes broad, truncate; panicles small.....21. *Zeugites.*

Spikelets 1–2-flowered, the second floret commonly obsolete, only the elongate rachilla present; glumes acuminate; panicle large and diffuse.....20. *Orthoclada.*

Blades linear, without apparent transverse veins.

Lemmas 3-nerved, the nerves prominent and often hairy.

Inflorescence a few-flowered head or a capitate panicle overtopped by the leaves or partly concealed in them. Lemmas toothed or cleft; low plants of arid regions. 64. *Munroa.*

Inflorescence an exserted, open or spike-like panicle.

Lemmas glabrous.....29. *Dissanthelium.*

Lemmas pubescent on the nerves.....53. *Gouinia.*

Lemmas 5–many-nerved, the nerves sometimes obscure.

Lemmas flabellate; glumes wanting; inflorescence dense and cylindric. A low annual.....19. *Anthochloa.*

Lemmas not flabellate; glumes present; inflorescence not cylindric.

Glumes with conspicuous thin translucent margins; upper florets much reduced, forming a stalked rounded mass.....18. *Melica.*

Glumes not conspicuously margined; upper florets sometimes reduced but not forming a stalked mass.

Lemmas as broad as long, the margins outspread; florets closely imbricate, horizontally spreading. 12. *Briza.*

Lemmas longer than broad, the margins clasping the palea; florets not horizontally spreading.

Lemmas awnless, obtuse or acutish.....11. *Poa.*

Lemmas awned or acuminate.

Spikelets terete, short-pediceled along the main axis, forming a simple raceme. 8. *Brachypodium.*

Spikelets laterally compressed, in an open or condensed panicle.

Awn dorsal on the lemma.10. *Amphibromus.*

Awn terminal or arising between the teeth of the lemma.

Awn arising between 2 short teeth, rarely almost wanting.....7. *Bromus.*

Awn terminal.....9. *Festuca.*

3. HORDEAE

Spikelets solitary at each node of the rachis, several-flowered.

Spikelets placed edgewise to the rachis.....27. *Lolium.*

Spikelets placed flatwise to the rachis.....24. *Agropyron.*

Spikelets more than one at each node of the rachis.

Spikelets 2 at each node of the rachis. Glumes narrow, acuminate or awned.....25. *Elymus.*

Spikelets 3 at each node of the rachis.

Glumes narrow, awned or awn-like; blades narrowly linear. 26. *Hordeum.*

Glumes broad and rounded, awnless; blades oblong or broader. 28. *Pariana.*

4. AVENEAE

Spikelets awnless. Glumes equal, longer than the florets; plants dwarf, subalpine, with small few-flowered panicles. 29. *Dissanthelium.*

Spikelets awned.

Awn of the lemma arising between the teeth of a bifid apex, flattened.

Plants robust, with large many-flowered plume-like panicles; awn spreading from near the scarcely twisted base, flexuous or loosely twisted above.....34. *Lamprothyrsus.*

Plants low and slender; panicles not large and plume-like; awn twisted below the bend, nearly straight above. 33. *Danthonia.*

Awn dorsal.

Awn short, inserted near the apex of the lemma..30. *Koeleria.*

Awn inserted near the base or toward the middle of the lemma.

Plants perennial.....31. *Trisetum.*

Plants annual.....32. *Avena.*

5. AGROSTIDEAE

Rachilla jointed below the glumes, the spikelets deciduous.

Spikelets in pairs in a spike-like panicle, one perfect, the other staminate or neuter, the pair falling together...40. *Lycurus.*

Spikelets all alike.

Glumes awned.....39. *Polypogon.*

Glumes awnless.

Inflorescence a dense spike-like panicle.....38. *Alopecurus.*

Inflorescence an open panicle.....37. *Cinna.*

Rachilla jointed above the glumes.

Fruit indurate, terete, or short and globose or ovoid (then sometimes somewhat compressed).

Awn trifid, the lateral awns rarely obsolete.....48. *Aristida.*

Awn simple.

Spikelets on short peduncles among the acicular leaves. Lemma extending into a hard awn-like point; plants almost moss-like, forming dense cushions...43. *Aciachne.*

Spikelets in exserted panicles.

Fruit terete, 2–several times as long as wide; awn persistent or tardily deciduous.....47. *Stipa.*

Fruit 1–2 times as long as wide; awn readily deciduous, more or less excentrically attached.

Lemma entirely enclosing the palea.....45. *Nassella.*

Lemma not quite enclosing the lemma, leaving a sulcus on the palea side.....46. *Piptochaetium.*

Fruit thin or firm, but scarcely indurate, if firm, the nerves evident; callus not well developed.

Rachilla prolonged behind the palea.....35. *Calamagrostis.*

Rachilla not prolonged.

Lemma shorter than the glumes, thin and delicate. 36. *Agrostis.*

Lemma as long as the glumes or longer, not more delicate than the glumes.

Lemma awnless, obtuse or acutish; one or sometimes both glumes shorter than the lemma.....44. *Sporobolus.*

Lemmas awned or acuminate or, if only acute, the acute glumes subequal.

Awn terminal, not geniculate.....41. *Muhlenbergia.*

Awn dorsal, geniculate, the lemma bifid at the apex. 42. *Triniochloa.*

6. NAZIEAE

Spikelets bearing hooked spines on the second glume, the group forming a small bur.....49. *Nazia.*

Spikelets not bearing hooked spines.

Groups of spikelets forming a close cylindric spike. 50. *Anthephora.*

Groups of spikelets nodding along one side of the delicate axis. 51. *Aegopogon.*

7. CHLORIDEAE

Inflorescence a few-flowered head or capitate panicle hidden among the sharp-pointed leaves. A low spreading annual.64. *Munroa.*

Inflorescence exserted.

Spikes solitary or racemosely arranged.

Spikes solitary.

Spikelets 1-flowered.....59. *Microchloa.*

Spikelets several-flowered.....55. *Tripogon.*

Spikes several.

Spikelets with 1 perfect floret and a rudiment above; spikes short and thick.....63. *Bouteloua.*

Spikelets 1–several-flowered; spikes long and slender.

Inflorescence dense and spike-like.....54. *Trichoneura.*

Inflorescence open.

Spikelets 1–2-flowered, the upper floret reduced or rudimentary.....60. *Gymnopogon.*

Spikelets several-flowered.

Lemmas awnless or short-awned; upper floret reduced to a small awnless lemma.....52. *Leptochloa.*

Lemmas with awns as long as the body; upper floret reduced but awned.....54. *Gouinia.*

Spikes more or less digitate.

Spikelets 1-flowered, the rachilla prolonged as an inconspicuous bristle.....58. *Cynodon.*

Spikelets 1-flowered, with a rudimentary floret above, or 2–several-flowered.

Lemmas 3-awned.....62. *Trichloris.*

Lemmas 1-awned or awnless.

Spikelets with 1 perfect floret and 1 or more rudimentary florets.....61. *Chloris.*

Spikelets 3–several-flowered.

Rachis prolonged beyond the spikelets.

57. *Dactyloctenium.*

Rachis not prolonged.....56. *Eleusine.*

8. PHALARIDEAE

A single genus in Peru.....65. *Phalaris.*

9. ORYZEAE

A single genus in Peru.....66. *Oryza.*

10. ZIZANIEAE

A single genus in Peru.....67. *Luziola.*

11. MELINIDEAE

A single genus in Peru.....69. *Arundinella.*

12. PANICEAE

Spikelets unisexual, the plants monoecious.

Panicles lax and usually large, terminal.....88. *Olyra.*

Panicles axillary and much reduced.....89. *Lithachne.*

Spikelets all of one kind.

Spikelets subtended or surrounded by 1–many distinct or more or less connate bristles, these forming an involucre.

Bristles persistent, the spikelets deciduous.....85. *Setaria.*

Bristles or spines falling with the spikelets at maturity.

Bristles not united, slender, sometimes plumose.

86. *Pennisetum.*

Bristles united to form a bur-like involucre, barbed, thickened.

87. *Cenchrus.*

Spikelets not subtended by bristles.

Glumes or sterile lemma awned (awn reduced to a point in *Echinochloa colonum*). Spikelets racemose on the branches.

Blades lanceolate, broad and thin; glumes 2-lobed, awned between the lobes.....83. *Oplismenus.*

Blades narrow and elongate; glumes awned from the tip.

84. *Echinochloa.*

Glumes and sterile lemma awnless (somewhat caudate in *Ichnanthus*).

Spikelets in open or condensed panicles.

Spikelets globose, oblique on the pedicels. Culms usually woody and often scandent.....79. *Lasiacis.*

Spikelets usually not globose, not obliquely set on the pedicels.

Spikelets with 2 perfect florets.....82. *Isachne.*

Spikelets with 1 perfect flower.

Fertile lemma with wings or broad scars at the base; glumes often somewhat caudate...78. *Ichnanthus.*

Fertile lemma neither winged nor broadly scarred at the base.

First glume wanting. Spikelets silky-hairy.

70. *Leptocoryphium.*

First glume present.

Fruit indurate, its margin inrolled. First glume usually shorter than the spikelet.

77. *Panicum.*

Fruit cartilaginous or membranaceous, the margin not inrolled.

First glume as long as the spikelet.

81. *Homolepis.*

First glume shorter than the spikelet.

80. *Hymenachne.*

Spikelets in one-sided racemes, the racemes digitate or racemose. (See also *Ichnanthus minarum*).

Rachilla joint and adnate first glume forming a swollen ring-like callus at the base of the spikelet.

74. *Eriochloa.*

Rachilla joint not forming a ring-like callus.

Blades ovate-lanceolate. Racemes loose; mature spikelets bur-like, with hooked hairs. 73. *Pseudechinolaena.*

Blades linear to oblong-lanceolate. Spikelets without hooked hairs.

First glume wanting (present only in a few species of *Paspalum*). Spikelets in 2–4 rows in close one-sided racemes.

Spikelets (or the primary ones of a pair) placed with the back of the fertile lemma turned away from the rachis.....75. *Axonopus.*

Spikelets placed with the back of the fertile lemma turned toward the rachis.....76. *Paspalum.*

First glume present.

Racemes loose, in a flabellate panicle. Spikelets conspicuously silky.....71. *Trichachne.*

Racemes close, one-sided, solitary, digitate, or racemose.

Racemes racemosely arranged on the main axis.

77. *Panicum.*

Racemes digitate or fascicled, rarely solitary.

72. *Digitaria.*

13. ANDROPOGONEAE

Spikelets all perfect.

Rachis continuous; low native plants.....90. *Imperata.*

Rachis disjointing; tall cultivated plants.....91. *Saccharum.*

Spikelets not all perfect, the sessile ones usually perfect, the pediceled ones usually staminate or rudimentary.

Fertile spikelet with a hairy-pointed callus formed of the attached supporting rachis joint or pedicel; awns well developed.

Awn plumose or pubescent; rachis continuous..97. *Trachypogon.*

Awn scabrous, not pubescent; rachis disjointing.

96. *Heteropogon.*

Fertile spikelet without a callus, the rachis disjointing immediately below the spikelet; awns relatively small or wanting.

Pedicel of the sterile spikelets thickened, appressed to the thickened rachis joint or adnate to it.

Sessile spikelets sunken in cavities of the thickened rachis, the first glume covering the opening. Sterile spikelet obscure.....99. *Rottboellia.*

Sessile spikelet not sunken in the rachis.

Plants annual; sessile spikelet globose...100. *Hackelochloa.*

Plants perennial; sessile spikelet lanceolate..98. *Elyonurus.*

Pedicel of the sterile spikelet distinct, this and the rachis joint usually slender.

Spikelets in reduced racemes of 1–5, rarely 7 joints, these pedunculate and forming open panicles. Awns, if present, usually deciduous.....95. *Sorghum.*

Spikelets in evident racemes of several to many joints.

Margins of the first glume of the sessile spikelet involute, the sides rounded rather than sharply keeled.
93. *Hyparrhenia.*

Margins of the first glume of the sessile spikelets inflexed, the glume sharply 2-keeled, the back flat or grooved between the keels.

Racemes in pairs subtended or enclosed by a broad spathe, aggregate in a large compound panicle, the lowest pair of spikelets of one of the racemes alike, staminate or neuter; plants aromatic.
94. *Cymbopogon.*

Racemes single, in pairs, digitate, or numerous, sometimes subtended by spathes; lowest pairs of spikelets like the upper ones, one fertile and sessile, the other pediceled and staminate or reduced; plants not aromatic.....92. *Andropogon.*

14. TRIPSACEAE

Staminate and pedicellate spikelets in separate inflorescences, the staminate in a terminal tassel, the pistillate in the leaf axils.....102. *Zea.*

Staminate and pistillate spikelets in separate portions of the same spike, the pistillate below.....101. *Coix.*

1. ARTHROSTYLIDIUM Rupr.

Climbing or trailing bamboos, the short and slender fertile branches fascicled along the main cane; inflorescence racemose; spikelets few-flowered, the lower 1–2 lemmas empty, the rachilla disarticulating between the florets, rarely below the glumes; stamens 3.

Arthrostylidium racemiflorum Steud. Syn. Pl. Glum. 1: 336. 1854.

Main cane slender, about 6 mm. thick, sometimes 5 m. long or more, climbing, the fertile shoots 10–30 cm. long; blades of fertile shoots 5–7 cm. long, 4–6 mm. wide, somewhat glaucous beneath and pubescent at the base, sometimes minutely pubescent on the surfaces; racemes 5–8 cm. long, the spikelets appressed, the rachis pubescent; lemmas 7-nerved, 6 mm. long, the awn 1–2 mm. long; palea longer than the body of the lemma, strongly ciliate on the keels.

Ayacucho; Estrella, between Huanta and Río Apurímac, 500 m., in dense woods, *Killip & Smith 23649*.—Junín: La Merced, 700 m., *Killip & Smith 23950*.—San Martín; Edge of forest, Tarapoto, *Williams 5807*. Ranging northward to Colombia and Mexico.

GUADUA PARVIFLORA Presl. Rel. Haenk. 1: 257. 1830. *Bambusa parviflora* R. & S. Syst. Veg. 7: 1350. 1830. *Arthrostylidium maculatum* Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3, pt. 1: 28. *pl. 5*. 1839.

Huánuco: Type collected in the mountains of Huánuco.

According to Hitchcock (Contr. U. S. Nat. Herb. 24: 307. 1927), this is probably a species of *Arthrostylidium*, but the species is imperfectly known, and it is doubtful what disposition should be made of it.

2. GUADUA Kunth

Tall spiny bamboos; spikelets subterete, several-flowered, mostly elongate, sessile or nearly so; palea winged; stamens 6.

Spikelets glabrous, 3–7 cm. long.....*G. angustifolia*.
Spikelets pubescent, 1.5–2 cm. long.....*G. Weberbaueri*.

Guadua angustifolia H. & B. Syn. Pl. Aequin. 1: 253. 1822. *Bambusa Guadua* H. & B. Pl. Aequin. 168. *pl. 20*. 1808.

A stout bamboo 10 m. high or more, the stems up to 15 cm. in diameter; blades about 15 cm. long and 1.2–1.8 cm. wide; spikelets often curved.

Reported from "Lima," collected by the Wilkes Exploring Expedition. Ranging to Colombia and the Guianas.

Herrera reports for this species the vernacular names "caña de Guayaquil" and "ipa." Like other native bamboos it is employed for purposes of construction.

Guadua Weberbaueri Pilger, Repert. Sp. Nov. 1: 152. 1905.

Plants 10 m. high, the branches climbing; blades elliptic-lanceolate, 12–14 cm. long, 2–3.5 cm. wide, pilose beneath, the summit of the sheath long-fimbriate; spikelets 2–3-flowered.

San Martín: In matorral or more rarely in moist forest, Moyobamba, 800–900 m., *Weberbauer 4562*, type.

Vernacular name, "marona."

3. ARUNDINARIA Michx.

Shrubs or tall bamboo-like grasses, the culms woody and perennial, branched; blades flat, jointed with the sheaths; spikelets arranged in loose racemes or panicles; spikelets few–many-flowered, usually large, compressed or sometimes terete, the rachilla disjointing above the glumes and between the florets; glumes unequal, shorter than the lemmas, the first sometimes wanting; lemmas acute, acuminate, or mucronate, faintly many-nerved.

Lemmas about 5 mm. long and 0.5 mm. thick..... *A. humillima.*

Lemmas larger, more than 1 mm. wide.

Lemmas short-awned..... *A. patula.*

Lemmas not awned.

Panicle open, the spikelets long-pediceled; blades triangular-ovate, about 4 cm. long and 12 mm. wide..... *A. Haenkei.*

Panicle condensed, the lateral pedicels shorter than the spikelets; blades linear-lanceolate, about 10 cm. long and 9 mm. wide..... *A. hirtula.*

Arundinaria Haenkei (Rupr.) Hack. Oesterr. Bot. Zeitschr. 53: 63. 1903. *Arthrostylidium Haenkei* Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 3, pt. 1: 27. 1839. *Arundinaria setifera* Pilger, Repert. Sp. Nov. 1: 145. 1905.

A shrub with spreading branches; blades 3–5 cm. long, 12–15 mm. wide; panicles terminating all the branches, diffuse, 15 cm. long, the branches long, slender, and naked; spikelets as much as 3 cm. long.

Huánuco: Monzón, *Weberbauer 3387*, type of *A. setifera*.—Type of *A. Haenkei* collected in Peru by Haenke, the exact locality unknown.

Arundinaria hirtula Pilger, Repert. Sp. Nov. 17: 445. 1921.

Culms up to 10 m. high and 5 cm. thick; blades 8–13 cm. long, 7–11 mm. wide; panicles 13 cm. long or more, numerous; spikelets brownish, 2.5 cm. long.

Libertad: Mixiollo Valley, 3,100 m., *Weberbauer 7031*, type collection.

Arundinaria humillima Pilger. Verh. Bot. Ver. Brandenb. 47: 100. 1905.

Culms about 50 cm. high; sheaths ciliate, the long hairs wrapped around the culm; blade about 15 cm. long and 1 cm. wide; panicle open, 10 cm. long and 2.5 cm. wide; spikelets slender, 1 cm. long, with distant florets.

Loreto: Cerro de Escalera, *Ule 6598*, type collection.

Arundinaria patula Pilger, Bot. Jahrb. 25: 719. 1898.

Culms low and slender or sometimes tall and as much as 3 cm. thick; blades ovate-lanceolate, 20 cm. long and 7 cm. wide or smaller, the mouth and margin of the sheath long-fimbriate; panicle very open and diffuse, sometimes 40 cm. long, the slender branchlets bearing a single spikelet; spikelets 2 cm. long or less; awn of the lemma 4 mm. long or shorter.

Huánuco: Playapampa, 2,700 m., in thickets, *4512*. Ranging to Colombia.

4. CHUSQUEA Kunth

Woody, erect or scandent bamboos; fertile shoots often in fascicles on the usually slender main culm; panicles mostly condensed, sometimes spike-like, rarely open; spikelets terete or almost so, with 2 small or minute glumes and 2 sterile lemmas usually shorter than the single fertile floret.

Panicles dense and spike-like, terminating erect branches. Plants low and erect; glumes 1 mm. long; sterile lemmas acuminate, more than half as long as the spikelet.

Panicle pale ..... *C. spicata.*

Panicle dark ..... *C. Weberbaueri.*

Panicles narrow but not spike-like, borne on the ends of short and usually fasciculate branches.

Glumes obsolete.....*C. depauperata.*
Glumes evident, but usually short and sometimes minute.
Inflorescence and branchlets more or less waxy-whitened.
Spikelets 1 cm. long or more.....*C. huantensis.*
Inflorescence and branchlets not waxy-whitened.
Blades pubescent beneath.
Spikelets pubescent; blades lanceolate.....*C. Dombeyana.*
Spikelets glabrous; blades linear.....*C. peruviana.*
Blades glabrous beneath.
Spikelets about 11 mm. long. Sterile lemmas long-acuminate, almost as long as the spikelet.....*C. picta.*
Spikelets commonly not more than 7 mm. long.
Branches of the panicle appressed.....*C. serrulata.*
Branches of the panicle spreading, the pedicels sometimes reflexed.....*C. scandens.*

Chusquea depauperata Pilger, Repert. Sp. Nov. 1: 149. 1905.

Plants suffrutescent, the culms branched: blades 4–6 cm. long, 3–3.5 mm. wide, firm and rigid, with subulate apex; summit of the sheath not fimbriate; panicle rather dense, narrow and spike-like, 6–9 cm. long; spikelets glabrous, brownish, the glumes 3–3.5 mm. long.

Huánuco; Mountains southwest of Monzón, 3,300 m., *Weberbauer 3709*, type collection.

Chusquea Dombeyana Kunth, Rév. Gram. 2: 553.*pl. 191.* 1832. *C. pubispicula* Pilger, Repert. Sp. Nov. 1: 148. 1905.

Culms slender, about 5 mm. thick; blades 8 cm. long and 6 mm. wide or smaller, slightly pubescent beneath; panicles narrow and interrupted, 8–15 cm. long, the axis and branches densely pubescent; spikelets pubescent.

Puno: Near Sandía, 2,800 m., *Weberbauer 688*, type of *C. pubispicula*. Type collected in Peru by Dombey, the locality not known.

Chusquea huantensis Pilger, Bot. Jahrb. 56: Beibl. 123: 29. 1920.

A high-climbing shrub; blades 8–11 cm. long, 11–18 mm. wide, firm, glabrous, scabrous on the margins, gradually narrowed from a rounded base, produced at the apex into a long slender tip; panicle rather loose but spike-like, contracted, pale brownish; spikelets 1 cm. long.

Ayacucho: Between Tambo and Río Apurímac, 3,000 m., *Weberbauer 5581*, type collection.—Cuzco: San Miguel, *Cook & Gilbert 965*.

Chusquea peruviana Camus, Bamb. Monogr. 88. *pl. 53, f. B.* 1913. *C. ramosissima* Pilger, Repert. Sp. Nov. 1: 149. 1905, non Lindm. 1900. *C. sandiensis* Pilger, Bot. Jahrb. 56: Beibl. 123: 29. 1920.

Blades linear, 7–9 cm. long, 2.5–3.5 cm. wide, sparsely long-pilose beneath, the apex produced into a slender point; panicle narrow and few-flowered, 8–10 cm. long, the rachis scabrous, the lowest branches about 3 cm. long.

Cuczo: Torontoi, *Heller 2180*.—Puno: Sandía, 2,900 meters, *Weberbauer 694*, type. Ecuador to Bolivia.

Chusquea picta Pilger, Repert. Sp. Nov. 1: 151. 1905.

Probably a tall shrub; blades 5–7 cm. long, 3–3.5 mm. wide, with a setaceous tip; panicle narrow and few-flowered, 5–9 cm. long; spikelets about 11 mm. long, glabrous; glumes very short.

Type collected in the Andes of Peru by Ruiz.

Chusquea scandens Kunth, Pl. Aequin. 1: 254. 1822. *Nastus Chusquea* HBK. Nov. Gen. & Sp. 1: 201. 1816.

Plants erect and 5 meters high, or often trailing over trees and shrubs; blades linear-lanceolate, 18 cm. long and 1–2.5 cm. wide or smaller, narrowed at the tip into a slender point; panicles narrow and dense or rather open, dark, 20 cm. long or less, the branches spreading or subappressed, the pedicels often reflexed.

Huánuco: Yanano, 1,800 meters, in sunny thickets, *3778*. Twelve miles south of Panao, 3,000 meters, *2212*. Pozuzo, 600 meters, *4589*. Bolivia to Colombia.

The stems are employed locally for making baskets.

Chusquea serrulata Pilger, Bot. Jahrb. 25: 719. 1898. *C. spadicea* Pilger, Bot. Jahrb. 27: 35. 1899.

Similar to *C. scandens*, usually 3–6 meters high, the culms 2.5 cm. thick; blades narrower and more distinctly striate; panicles narrow, with appressed branches.

Huánuco: Mito, 2,700 meters, abundant in all stream canyons, *1687*. Bolivia to Colombia. "Carrizo," "caña brava," "malloa."

The canes are employed extensively for house partitions and the framework of roofs.

Hitchcock (Contr. U. S. Nat. Herb. 24: 312. 1927) states that the following species, all described from Peru, probably can not be distinguished from *C. serrulata*: *Chusquea polyclados* Pilger, Repert. Sp. Nov. 1: 147. 1905 (above Hacienda La Tahona near Hualgayoc, Dept. Cajamarca, *Weberbauer 4021*); *C. straminea* Pilger, loc. cit. (Chachapoyas, Dept. Amazonas, *Weberbauer 4408*); *C. inamoena* Pilger, op. cit. 150 (mountains west of Huacapistana, Junín, *Weberbauer 2295*); *C. tarmensis* Pilger, op. cit. 151 (near Yanangu, Junín, *Weberbauer 2129*).

Chusquea spicata Munro, Trans. Linn. Soc. 26: 60. 1868. *C. simplicissima* Pilger, Repert. Sp. Nov. 1: 145. 1905.

Plants low and erect; blades firm, erect, 1.5–2 cm. long, 1 cm. wide, scaberulous on the margins; panicles dense and spike-like, interrupted below, 10–15 cm. long; glumes 1–2 mm. long.

Junín: Mountains near Huacapistana, 3,300 meters, *Weberbauer 2217*, type of *C. simplicissima*.—Puno: Sachapata, *Lechler 2154, 2640, 2694*, type material of *C. spicata*. Also in Bolivia.

Chusquea Weberbaueri Pilger, Repert. Sp. Nov. 1: 146. 1905.

Plants erect, about 2 meters high; blades firm, appressed, 8–12 cm. long, 5–6 mm. wide; produced at the apex into a setiform tip; panicles spike-like, 15–30 cm. long; spikelets glabrous and commonly dark-colored.

Amazonas; Between Tambo Ventillas and Piscohuanama, near Chachapoyas, 3,300 meters, *Weberbauer 4415*, type. Also in Colombia.

5. MEROSTACHYS Spreng.

Plants large and coarse, the inflorescence a one-sided spike; spikelets with 1 perfect floret and 1–2 sterile lemmas, the rachilla prolonged behind the many-nerved palea.

Merostachys brevispica Munro, Trans. Linn. Soc. 26: 49. 1868.

Sheaths densely fimbriate; blades oblong-lanceolate, those of the branches 7–10 cm. long and 1–1.5 cm. wide, inflorescence arcuate, 4–5 cm. long.

San Martín: Type from forests of Tarapoto, *Spruce* in 1856.

6. NEUROLEPIS Meisn.

Plants large and coarse, erect, herbaceous or somewhat woody at the base; blades large, commonly more than 50 cm. long and

6 cm. wide, the blades continuous with the sheath; inflorescence a large panicle; spikelets with 2 glumes, 2 sterile lemmas, and a terminal perfect floret; stamens 3.

Glumes much exceeding the perfect floret ..... *N. Stuebelii.*
Glumes equaling or shorter than the perfect floret.. *N. Weberbaueri.*

Neurolepis Stuebelii Pilger in E. & P. Pflanzenfam. Ergänz. 2: 21. 1906. *Planotia Stuebelii* Pilger, Bot. Jahrb. 25: 720. 1898.

Plants 2–3 meters high, with a loose rhizomatous base; sheaths somewhat pubescent; blades up to 1 meter long and 6 cm. wide, often sparsely pilose; panicles large and open, 50 cm. long or more, densely flowered; glumes long-acuminate.

Without definite locality, *Weberbauer 7159.* Also in the mountains of Ecuador and Colombia.

Neurolepis Weberbaueri Pilger, Repert. Sp. Nov. 17: 446. 1921.

Plants large, as much as 4 meters high; blades glabrous, up to 2 meters long and 6 cm. wide; panicles often nearly 1 meter long, lax, the branches erect, recurved, or reflexed.

Libertad: Mixiollo Valley, Prov. Pataz, 3,000–3,300 meters, *Weberbauer 7030,* type collection.

7. BROMUS L. Brome grass

Annuals or perennials; sheaths closed, the blades flat; panicles open or contracted; spikelets large, several–many-flowered, the rachilla disjointing above the glumes and between the florets; glumes unequal, acute, the first 1–3-nerved, the second usually 3–5-nerved; lemmas convex on the back or keeled, 5–9-nerved, 2-toothed at the apex, with or without an awn between the teeth; palea usually shorter than the lemma, ciliate on the keels.

Awn twisted; teeth of the lemma prominent, 2–3 mm. long. . *B. Trinii.*
Awn straight or sometimes obsolete; teeth of the lemma minute.
Culms usually less than 10 cm. high; lemmas densely woolly. *B. villosissimus.*
Culms mostly 20–30 cm. high or more; lemmas glabrous or pubescent but not densely woolly.
Spikelets strongly compressed-keeled; lemmas glabrous, scabrous, or sparsely pilose along the principal nerves, not pubescent or villous.
Awn 5 mm. long or less, sometimes wanting. . . *B. catharticus.*

Awn 10–15 mm. long.....*B. striatus.*

Spikelets not strongly compressed-keeled; lemmas pubescent.

Branches villous; lemmas densely pubescent on the margins. *B. lanatus.*

Branches scabrous; lemmas somewhat pubescent on the margins or short-pubescent all over.....*B. pitensis.*

Bromus lanatus HBK. Nov. Gen. & Sp. 1: 150. 1816.

Plants perennial, erect, loosely tufted, the culms glabrous or pubescent, 60 cm. high or less; blades flat, villous on the upper surface and sometimes also beneath; panicles loose and open, nodding, rather few-flowered, the axis and the slender flexuous branches velvety-pubescent.

Arequipa: Sumbai, 4,000 meters, *Weberbauer 6902.*—Junín: Huarón, 4,200 meters, rocky slopes, *1150.* Mount La Juntay, near Huancayo, 4,700 meters, *Killip & Smith 22097.* Río Blanco, upland slope, 4,500 meters, *801.*—Puno: Lagunillas, *Harlan* in 1914. Colombia to Bolivia.

Some of the Peruvian specimens have been referred to *B. Buchtienii* Hack. and *B. frigidus* Ball.

Bromus pitensis HBK. Nov. Gen. & Sp. 1: 152. 1816. *B. lenis* Presl, Rel. Haenk. 1: 262. 1830. *B. tenuis* Presl ex Steud. Syn. Pl. Glum. 1: 319. 1854, error for *B. lenis. B. frigidus* Ball, Journ. Linn. Soc. Bot. 22: 63. 1885. *B. Buchtienii* Hack. Repert. Sp. Nov. 11: 30. 1912.

Perennial, erect or spreading, the culms sometimes 1.5 meters long; blades flat, glabrous or somewhat pilose; panicles open, drooping or nodding, 30 cm. long or less, the branches very slender and somewhat flexuous, naked below, bearing 1–few spikes.

Cuzco: Marcapata, 3,200 meters, *Weberbauer 7783.*—Huánuco: Huánuco, *Haenke,* type of *B. lenis.*—Junín: Gollarisquisga, *Hitchcock 22312.* Cerro de Pasco, *Hitchcock 22231.* Río Blanco, 3,600 meters, grassy slope, *643.*—Lima: Casapalta, *Ball* in 1882, type of *B. frigidus.*

Bromus striatus Hitchc. Contr. U. S. Nat. Herb. 24: 316. 1927.

Annual, the culms glabrous or slightly pubescent below the nodes, erect, 80 cm. high or less; blades flat, sparsely short-pilose, 4–8 mm. wide; panicle open, nodding, 10–15 cm. long; spikelets 2.5–3 cm. long.

Arequipa: Mollendo, sandy hill slopes, *Hitchcock 22386*, type collection.

Bromus Trinii Desv. in Gay, Fl. Chil. 6: 441. 1853.

An erect annual, 60 cm. high or less; blades flat, sparsely villous; panicles narrow but rather open, the lower branches in whorls, slender, naked below, often flexuous.

Arequipa: Arequipa, bare canyon slopes, 2,800 meters, *Pennell 13250*.—Cuzco: Cuzco. *Hitchcock 22495*.—Lima: Matucana, 2,400 meters, loose slopes or in swales, *227*, *231*. Obrajillo, *Wilkes Exped.* Chile to California.

Bromus catharticus Vahl, Symb. Bot. 2: 22. 1791. *Bromus unioloides* HBK. Nov. Gen. & Sp. 1: 151. 1816. *?B. Mathewsii* Steud. Syn. Pl. Glum. 1: 323. 1854. *Ceratochloa simplex* Nees ex Steud. loc. cit., as syn.

An annual or short-lived perennial, erect or spreading, 1.5 meters high or less; blades flat and usually glabrous; panicles simple or open and spreading, 30 cm. long or less.

Arequipa: Arequipa, *Hitchcock 22430*.—Ayacucho: Choimacota Valley, 3,100 meters, *Weberbauer 7586*.—Cuzco: Cuzco, *Hitchcock 22467*.—Junín: Yanahuanca, 3,000 meters, rocky slope, *1253*.—Río Blanco, 3,600 meters, *647*, *651*.—Lima: Matucana, 2,400 meters, railroad embankment, *253*.—Puno: Juliaca, *Harlan* in 1914. Colombia to Argentina and Chile; naturalized in southern United States.

B. catharticus and *B. Mathewsii* were described from Peru, the latter being based on *Mathews 54*. Hitchcock has preferred to use the later name *unioloides* for the collective species, a highly variable one, until all its forms have been studied, but there appears no doubt that the earlier name *catharticus* is the proper one for the Peruvian plant, at least.

Bromus villosissimus Hitchc. Proc. Biol. Soc. Washington 36: 195. 1923.

Plants dwarf and cespitose, perennial, the culms ascending, 10 cm. high or less; blades involute, pubescent, 5 cm. long or less; panicles simple, condensed, 1–2 cm. long, with 3–8 broad woolly spikelets.

Lima: Casapalca, 4,650 meters, loose soil of alpine slopes, *854*, type.—Junín: Between Casa Cancha and Culnai, *Wilkes Exped.*

8. BRACHYPODIUM Beauv.

Slender annuals or perennials with commonly flat blades; spikelets many-flowered, narrow, almost terete, short-pediceled, forming a simple raceme; lemmas usually awned from the apex, 7–9-nerved; palea with stiffly ciliate keels.

Brachypodium mexicanum Link, Hort. Berol. 1: 41. 1827.

A slender straggling perennial less than 1 meter high; blades 4 mm. wide; racemes about 5 cm. long; spikelets 1.5–2 cm. long, rather distant, at first appressed, becoming reflexed or spreading.

Cuzco: Cuzco, *Hitchcock 22482, 22488.*—Junín: Baños, *Wilkes Expl. Exped.* Gollarisquisga, *Hitchcock 22298.* Bolivia to Mexico.

The plant has much the aspect of a *Bromus.*

9. FESTUCA L. Fescue grass

Perennials or annuals with long narrow blades and narrow or open panicles; spikelets few–several-flowered, the rachilla disjointing above the glumes and between the florets; glumes narrow, unequal, acute, the first sometimes very small; lemmas rounded on the back, membranaceous or somewhat indurate, 5-nerved, acute or rarely obtuse, awned from the tip or from a minutely bifid apex.

Plants annual. Panicles narrow; florets narrow and long-awned.

Lemmas ciliate toward the apex; first glume usually less than 1 mm. long; panicles usually more than 10 cm. long. *F. megalura.*

Lemmas not ciliate; first glume commonly 2 mm. long or more; panicles usually less than 6 cm. long..... *F. australis.*

Plants perennial.

Panicles open, more than 10 cm. long.

Blades thin and lax; lemmas awned, the awn about as long as the body.

Second glume 3-nerved; lemmas compressed, the nerves distinct; awn arising between the minute teeth of the bifid apex of the lemma, straight..... *F. Presliana.*

Second glume 1-nerved, narrow; lemmas almost terete, with obscure nerves; awn terminal, becoming flexuous and implicate..... *F. ulochaeta.*

Blades firm, flat or involute; lemmas awnless or, if awned, the awn shorter than the body.

Lemmas 10–12 mm. long..... *F. dichoclada.*

Lemmas 5–7 mm. long.

Basal sheaths becoming fibrous.....*F. compressifolia.*

Basal sheaths not becoming fibrous.

Blades flat.....*F. procera.*

Blades all or chiefly involute.....*F. sublimis.*

Panicles contracted or, if somewhat open, less than 10 cm. long.

Panicles short, usually less than 5 cm. long, few-flowered, the lower branches naked for 1–2 cm.

Culms and panicle branches becoming flexuous or S-shaped in fruit, the panicle finally deciduous as a whole; glumes awn-pointed; lemmas toothed at the base of the awn. *F. casapaltensis.*

Culms and panicle branches remaining straight or nearly so, the panicle not deciduous; glumes acute; lemmas not toothed.....*F. parvipaniculata.*

Panicles narrow, many-flowered, commonly more than 5 cm. long, the branches appressed, some of those of each fascicle flower-bearing almost to the base.

Panicles spike-like, usually less than 8 cm. long. Leaves in a short basal cluster.....*F. rigescens.*

Panicles narrow, usually elongate or, if as short as 8 cm., scarsely spike-like.

Lemmas pubescent on the margins.....*F. orthophylla.*

Lemmas not pubescent on the margins.

Lemmas thin, scarious at the apex.....*F. glyceriantha.*

Lemmas not thin and scarious-tipped...*F. dolichophylla.*

Festuca australis Nees ex Steud. Syn. Pl. Glum. 1: 304. 1854.

Annual, erect or spreading, 10–30 cm. high; panicles narrow and dense, commonly not more than 6 cm. long.

Junín: Gollarisquisga, *Hitchcock 22287.* General in temperate regions of South America.

Festuca casapaltensis Ball, Journ. Linn. Soc. Bot. 22: 62. 1885. *Bromus Weberbaueri* Pilger, Bot. Jahrb. 37: 517. 1906.

A dwarf perennial, forming dense tussocks, the culms slender, 10–15 cm. long, bearing a single leaf below the middle; basal blades numerous, involute, arcuate, 1–2 cm. long; panicles open, 2–3 cm. long, few-flowered, the branches in age recurved-spreading.

Ancash: Ocros, *Weberbauer 2814*, type of *Bromus Weberbaueri*.—Junín: Cerro de Pasco, *Hitchcock 22227*. Baños, *Wilkes Exped.*—Lima: Casapalca, *Ball*, type.

Festuca compressifolia Presl, Rel. Haenk. 1: 259. 1830. *F. fibrifera* Pilger, Bot. Jahrb. 27: 509. 1906.

A coarse perennial, forming dense clumps, erect, 1 meter high or less; blades narrow, firm and rather stiff, involute, scabrous; panicles open, 10–20 cm. long, the spreading branches naked toward the base; spikelets green or purplish.

Huánuco: Type from Huánuco, *Haenke*. Mito, 2,700 meters, steep slopes or edge of thickets, *3317*, *3268*, *1695*.—Junín: Tarma, *Weberbauer 2462*, type of *F. fibrifera;* 3,600 meters, limestone slopes, *1066*. Chinche, 3,450 meters, open slopes, *1282*.—Lima: La Oroya, 3,600 meters, *949*. Matucana, 2,400 meters, among low shrubs on steep slope, *334*.

Some of the collections cited were determined as *F. dissitiflora* Steud. and *F. horridula* Pilger.

Festuca dichoclada Pilger, Bot. Jahrb. 37: 514. 1906.

A stout perennial, the culms 1–2 meters high; blades more or less involute, 4–7 mm. wide, firm; panicles large, the long slender spreading branches naked toward the base; first glume 5–6 mm. long, the second 7–8 mm.; lemmas 1 cm. long, scaberulous, acute.

Ancash: Caraz, *Weberbauer 3230*, type.—Cuzco: Ollantaitambo, *Cook & Gilbert 510*.—Lima: Río Blanco, 4,500 meters, on slopes, *3045*. Also in Ecuador.

Festuca dolichophylla Presl, Rel. Haenk. 1: 258. 1830. *Diplachne scirpifolia* Presl, op. cit. 261. *F. scirpifolia* Kunth, Rév. Gram. 1: Suppl. 31. 1830. *F. setifolia* Steud. ex Griseb. Abh. Ges. Wiss. Goett. 19: 251. 1874. *F. lasiorachis* Pilger, Bot. Jahrb. 37: 508. 1906. *F. carazana* Pilger, op. cit. 511. 1906. *F. distichovaginata* Pilger, op. cit. 511. 1906. *F. Weberbaueri* var. *foliosa* Pilger, op. cit. 513. 1906. *F. horridula* Pilger, op. cit. 514. 1906. *F. tarmensis* Pilger, op. cit. 515. 1906. *F. inarticulata* Pilger, op. cit. 516. 1906. *F. Weberbaueri* Pilger, Bot. Jahrb. 37: 512. 1906. *F. cajamarcae* Pilger, op. cit. 513. 1906. *F. Buchtienii* Hack. Repert. Sp. Nov. 6: 160. 1908. *F. distichovaginata* var. *carazana* St. Yves, Candollea 3: 220. 1927. *F. distichovaginata* var. *cajamarcae* St. Yves, op. cit. 222. 1927. *F. scirpifolia* var. *inarticulata* St. Yves, op. cit. 225. 1927.

F. scirpifolia subsp. *tarmensis* St. Yves, op. cit. 232. 1927. *F. laeteviridis* var. *lasiorrhachis* St. Yves, op. cit. 239. 1927.

An erect stiff perennial, forming dense clumps 1 meter high or less; blades slender, stiff, involute, glabrous or scabrous; panicles narrow but sometimes rather open, 5–15 cm. long or more, the branches erect or ascending; spikelets green or purple; lemmas awnless or mucronate, rarely short-awned.

Ancash: Caraz, *Weberbauer 3106*, type of *F. carazana; 3218*, type of *F. inarticulata*.—Cajamarca: Hualgayoc, *Weberbauer 3974*. —Cuzco: Torontoi, *Bingham 728*.—Huánuco: Type collected in the region of Huánuco by *Haenke*. Mito, 2,700 meters, *3362*. Fifteen miles northeast of Huánuco, 4,200 meters, on plains, *2172*. Tambo de Vaca, 3,900 meters, wet rocky uplands, *4904*. Monzón, *Weberbauer 3317*, type of *F. distichovaginata*.—Junín: Tarma, *Weberbauer 2233*, type of *F. tarmensis*.—Lima: Río Blanco, 3,600 meters, *649*. La Oroya, 3,600 meters, *950; Weberbauer 2586*, type of *F. horridula*. —Moquehua: Sailapa, 3,600 meters, *Weberbauer 7346*.—Puno: Cuyocuyo, *Weberbauer 904, 907*, type material of *F. lasiorachis*. Sandía, *Weberbauer 589*. Chuquibambilla, 3,900 meters, grassy meadow, *Pennell 13381*. Araranca, 4,200 meters, ledges of siliceous rock, *Pennell 13457*. Ecuador to Bolivia. Type of *F. setifolia* collected in Peru, *Lechler 1826*.

Hitchcock (Contr. U. S. Nat. Herb. 24: 324. 1927) states that some of the names cited in synonymy may perhaps represent valid species, distinct from *F. dolichophylla*. Some of the collections cited were determined originally as *F. disstiflora* Steud. and *F. subulifolia* Scribn.

Festuca glyceriantha Pilger, Bot. Jahrb. 37: 516. 1906. *F. scirpifolia* subsp. *glyceriantha* St. Yves, Candollea 3: 231. 1927.

A coarse perennial about 1 meter high; blades firm, smooth, folded; panicle narrow, 20–25 cm. long, the main branches appressed and few-flowered; spikelets appressed to the main rachis, 12–14 mm. long.

Ancash: Above Lake Yanganuco near Yungai, 4,100 meters, *Weberbauer 3275*, type.

Festuca megalura Nutt. Journ. Acad. Phila. II. 1: 188. 1848.

A slender annual, erect or spreading, 60 cm. high or less, often much branched from the base; blades slender, long and narrow; panicles narrow and almost spike-like, usually more than 10 cm. long; lemmas ciliate.

Arequipa: Mollendo, sandy desert hills, *Hitchcock 22387.*—Cuzco: Cuzco, *Hitchcock 22474.*—Huánuco: Mito, 2,700 meters, *1729.*—Junín: La Quinhua, 3,600 meters, in potato field, *2032.*—Lima: Río Blanco, 3,600 meters, on dryer slopes, *653.* Matucana, 2,400 meters, moist swales, *226.*—Puno: Juliaca, *Harlan* in 1914. In temperate regions, Chile to British Columbia.

Festuca orthophylla Pilger, Bot. Jahrb. 25: 717. 1898. *F. orthophylla* var. *glabrescens* Pilger, Bot. Jahrb. Engler 37: 507. 1906.

A stout erect perennial 75 cm. high or less, forming dense clumps; blades stiff, involute, glabrous, often equaling the culms; panicles narrow, 5–15 cm. long, often spike-like, the short branches ascending; lemmas pubescent on the margins.

Arequipa: Type from Arequipa, *Stuebel 87.* Between Arequipa and Puno, *Weberbauer 4842.* Sumbai, 4,200 meters, *Weberbauer 6897.* Above Chivai, 4,000 meters, *Weberbauer 6892.*—Cuzco: Cuzco, *Hitchcock 22455.*—Puno: Pucará, *Weberbauer 408,* type of var. *glabrescens.*—Tacna: Mountains north of Candarave, 4,600 m., *Weberbauer 7360.* Also in Bolivia.

Festuca parvipaniculata Hitchc. Contr. U. S. Nat. Herb. 24: 322. 1927.

A cespitose perennial, the culms 15–30 cm. high; blades glabrous, involute, 15 cm. long or less; panicle narrow and few-flowered, 3–5 cm. long, the branches short, ascending or appressed; spikelets mostly 3-flowered; first glume 5 mm. long.

Junín: Cerro de Pasco, 4,200 meters, *Hitchcock 22244,* type; *22245.* Hacienda Atocsaico, *Hitchcock 22193.*

Festuca Presliana Hitchc. Contr. U. S. Nat. Herb. 24: 320. 1927. *Bromus depauperatus* Presl, Rel. Haenk. 1: 263. 1830, non *Festuca depauperata* Bertol. 1834.

A tall slender perennial, the blades flat; panicles large and open, the spikelets awned; awn nearly or quite as long as the 5-nerved scaberulous lemmas, arising between 2 small teeth.

Junín: Baños, *Wilkes Exped.* Type collected by Haenke.

The type locality was given originally as Nootka Sound, British Columbia, but, according to Hitchcock (loc. cit.), the plant probably is really a Peruvian one.

Festuca procera HBK. Nov. Gen. & Sp. 1: 154. 1816.

A slender perennial 1–2 meters high; blades mostly flat, very narrow and elongate; panicles open, 10–30 cm. long.

Arequipa: Volcán de Misti, 3,200 meters, *Pennell 13231*. Nevado de Chachani, 3,800 meters, dry stream bed, *Pennell 13272*. Colombia to Bolivia.

Festuca rigescens (Presl) Kunth, Rév. Gram. 1: Suppl. 31. 1830. *Diplachne rigescens* Presl, Rel. Haenk. 1: 260. 1830. *D. brevifolia* Presl, op. cit. 261. 1830. *F. Haenkei* Kunth, Rév. Gram. 1: Suppl. 32. 1830. *F. humilior* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 1: 35. 1841. *F. dissitiflora* Steud. ex Griseb. Abh. Ges. Wiss. Goett. 24: 287. 1879. *F. Haenkei* var. *humilior* St. Yves, Candollea 3: 206. 1927.

Plants perennial, erect, cespitose, 20–40 cm. high; blades stiff, involute, glabrous; panicles narrow, pale, rather few-flowered, 5–10 cm. long; spikelets chiefly 3–4-flowered; lemmas somewhat indurate, nerveless, rather turgid.

Cuzco: Cuzco, *Hitchcock 22453*.—Huánuco: Type from Huánuco, *Haenke*. Huacho, 3,450 meters, in swales, *2461*.—Junín: San José, 3,900 meters, common on slopes and plains, *1112*. La Quinhua, 4,200 meters, rocky cliff, *Hitchcock 22282*. Mount La Juntai, near Huancayo, 4,700 m., *Killip & Smith 22095*. Hacienda Atocsaico, 4,000 meters, bottomland of stream, *Hitchcock 22191, 22197*.—Lima: La Oroya, 3,600 meters, *981*. Río Blanco, 3,300 meters, open hillside, *Killip & Smith 21721*.—Puno: Macusani, *Lechler 1829*, type of *F. dissitiflora*. Also in Bolivia. Type of *Diplachne brevifolia* from Huánuco, *Haenke;* type of *F. humilior* from mountains of Peru.

The tough leaves and culms of this plant are employed for making coarse rope.

Festuca sublimis Pilger, Bot. Jahrb. 25: 718. 1898. *F. tectoria* St. Yves, Candollea 3: 240. *f. 60*. 1927. *F. sublimis* f. *vivipara* St. Yves, op. cit. 255. 1927.

An erect perennial, sometimes 1 meter high, forming dense clumps; leaves slender, elongate, involute, glabrous; panicles open, green or purple, 15–25 cm. long, the very slender branches mostly ascending.

Ayacucho: Coracora, 3,200 m., *Weberbauer 5811* (type collection of *F. tectoria*).—Cuzco: Paso de Tres Cruces, 3,800 meters, open grassy paramo, *Pennell 13845*. Sacsahuamán, 3,600 meters, rocky stream bank, *Pennell 13552*. Tambo Tres Cruces, 3,760 meters, *Weberbauer 6922*.—Puno: Chuquibambilla, 3,900 meters, *Pennell 13416*. Ecuador to Bolivia.

Festuca ulochaeta Steud. Syn. Pl. Glum. 1: 305. 1854.

A lax perennial about 1 meter high; blades thin, flat, 5 mm. wide; panicles open, 15–20 cm. long.

Cuzco: Ollantaitambo, *Hitchcock 22532*. Ecuador to Bolivia and Brazil.

10. AMPHIBROMUS Nees

Perennials with narrow blades and narrow elongate panicles, the culms sometimes bulbous at the base; spikelets several-flowered, the rachilla disjointing above the glumes and between the florets; glumes ovate or lanceolate, acute or obtuse, often erose, the first rather narrow, 1-nerved, the second broader, 3–5-nerved; lemmas firm, lobed or dentate, 5–9-nerved, awned from the back, the awns geniculate, spreading or recurved.

Amphibromus scabrivalvis (Trin.) Swallen, Amer. Journ. Bot. 18: 413. 1931. *Avena scabrivalvis* Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2, pt. 1: 28. 1836.

Perennial, erect, 30–100 cm. high, spreading by rhizomes, the base bulbous; blades flat, 2–6 mm. wide; panicles narrow, 6–25 cm. long, the branches ascending or drooping, often flexuous; spikelets 15–30 mm. long, 3–6-flowered; lemmas hispid; awns 8–12 mm. long.

Puno: Ocapampa, *Shepard 57*. Bolivia to Chile and Uruguay.

11. POA L. Bluegrass

Annuals or perennials with narrow elongate blades; panicles open or contracted; spikelets 2–several-flowered, the rachilla disjointing above the glumes and between the florets, the uppermost floret reduced or rudimentary; glumes somewhat unequal, acute, keeled, the first 1-nerved, the second usually 3-nerved; lemmas somewhat keeled, acute or acutish, not awned, membranaceous, often somewhat scarious at the tip, 5-nerved.

Panicles narrow and more or less condensed, the short branches floriferous to the base or nearly so.

Lemmas pubescent on the keel and lateral nerves.

Plants annual; lemmas 2 mm. long..... *P. scaberula.*

Plants perennial; lemmas 3–4 mm. long..... *P. subspicata.*

Lemmas glabrous or scabrous.

Plants dwarf, the culms naked, rather stout, 5 cm. high or less, the capitate panicles of few or several spikelets.

Lemmas firm, not lacerate; spikelets 2-flowered. *P. chamaeclinos.*

Lemmas rather thin, obtuse and lacerate; spikelets 3–4-flowered..... *P. humillima.*

Plants 10 cm. high or more or, if dwarf, the culms leafy and the oblong panicles at least 15 mm. long.

Panicle slender and loosely flowered. Spikelets elliptic, 2-flowered; culms 7–12 cm. high..... *P. brevis.*

Panicle compact..... *P. gymnantha.*

Panicles more or less open, the branches spreading, the lower ones naked at the base (branches appressed in *P. nigriflora*).

Lemmas glabrous or scabrous.

Branches of the panicle appressed. Lemmas scabrous on the upper part..... *P. nigriflora.*

Branches of the panicle spreading.

Lemmas scabrous. Glumes much shorter than the first lemma. *P. carazensis.*

Lemmas smooth or almost so.

Creeping rhizomes present; sheaths smooth; lowest sheaths finally fibrous..... *P. fibrifera.*

Creeping rhizomes absent; sheaths scabrous; lowest sheaths not becoming fibrous.

First lemma 5–6 mm. long..... *P. Gilgiana.*

First lemma 3–4 mm. long..... *P. Pardoana.*

Lemma pubescent on the back or on the nerves or with a few long tangled hairs at the base.

Lemma with long tangled hairs at the base.

Sheaths scabrous..... *P. trivialis.*

Sheaths glabrous. *P. pratensis.*

Culms erect; spikelets 3–6-flowered..... *P. pratensis.*

Culms decumbent; spikelets 2-flowered... *P. aequatoriensis.*

Lemma without long tangled hairs at the base.

Blades involute, scabrous..... *P. asperiflora.*

Blades flat or folded.

Plants annual. Panicles usually 5 cm. long or less. *P. annua.*

Plants perennial.

Panicles commonly 15–30 cm. long..... *P. horridula.*

Panicles mostly 5–10 cm. long..... *P. Candamoana.*

Poa annua L. Sp. Pl. 68. 1753. *P. algida* Trin. Linnaea 10: 306. 1836. *P. Meyenii* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 31. 1841.

A low tufted annual, rarely more than 30 cm. high, the culms often decumbent and spreading; blades green, rather short, flat; panicles pale green, open, broad, commonly less than 5 cm. long.

Arequipa: Arequipa, *Hitchcock 22436*.—Cuzco: Valle de San Miguel, 2,200 meters, *Herrera*. Cuzco, *Hitchcock 22495½*.—Huánuco: Mito, 2,700 meters, *1712*.—Lima: San Gerónimo, 150 meters, rocky hillside, *5906*.—Junín: Cerro de Pasco, *Hitchcock 22248*. Type of *P. algida* from Cerro de Pasco.—Puno: Type of *P. Meyenii* from Lake Titicaca. Chuquibambilla, *Hitchcock 22451*. Native of Europe; widely naturalized in American temperate regions.

Poa aequatoriensis Hack. Oesterr. Bot. Zeitschr. 52: 450. 1902.

Plants perennial, the culms lax and decumbent, 40–80 cm. long; blades flat, lax; panicles open, nodding, 10–15 cm. long, the branches capillary, naked below.

Ayacucho: Choimacota Valley, 2,900 meters, *Weberbauer 7573*. Ecuador.

Poa aestivalis Presl (Rel. Haenk. 1: 272. 1830), originally ascribed incorrectly to the mountains of Peru, was really from California.

Poa asperiflora Hack. Repert. Sp. Nov. 11: 28. 1912.

An erect perennial, forming dense clumps, 60 cm. high or less; blades erect, involute, scabrous; panicles open, nodding, the slender branches naked toward the base, finally reflexed.

Junín: Viso, 2,700 meters, in stony soil, *629*. Oroya, 3,000 meters, hanging from face of rocky cliff, *Hitchcock 22175*.—Lima: Río Blanco, 4,500 meters, on slopes, *3001*. Also in Bolivia.

Poa brevis Hitchc. Contr. U. S. Nat. Herb. 24: 328. 1927.

A low cespitose perennial, the culms 5–10 cm. high; blades flat or folded, 1 mm. wide; panicles narrow and few-flowered, 2–3 cm. long, pale, the branches appressed; spikelets 2-flowered, 3 mm. long.

Huánuco: Tambo de Vaca, 3,900 meters, wet mossy rocky open uplands, *4356*, type.

Poa Candamoana Pilger, Bot. Jahrb. 37: 381. 1906.

A perennial, forming dense clumps, usually about 30 cm. high but often taller; blades narrow and firm, often rather short; panicles green or purplish.

Arequipa: Arequipa, 2,600 meters, rock ledges, *Pennell 13193.*—Cuzco: Sacsahuamán Hills, 3,500 meters, *Herrera 844.* Cuzco, hillsides, *Hitchcock 22469.*—Junín: La Oroya, 3,000 meters, river bottoms, *Hitchcock 22188.* Gollarisquisga, 4,150 meters, along irrigating ditch, *Hitchcock 22289.*—Lima: Río Blanco, 4,500 meters, stony hilltop, *2969.*—Moquehua: Carumas, 3,000 meters, *Weberbauer 7310.*—Puno: Azángaro, *Weberbauer 472,* type. Also in Bolivia.

The species was named in honor of a former President of Peru.

Poa carazensis Pilger, Bot. Jahrb. 37: 380. 1906.

An erect cespitose perennial 30 cm. high; blades flat, mostly basal; panicles open, about 4 cm. long, the branches finally spreading or reflexed; spikelets mostly 3-flowered.

Ancash: Cordillera Negra above Caraz, 4,200 meters, *Weberbauer 3073,* type.

Poa chamaeclinos Pilger, Bot. Jahrb. 37: 379. 1906.

A dwarf cespitose perennial, the culms 2 cm. long or less; blades firm, short, commonly 5–12 mm. long, involute; panicles few-flowered, about 1 cm. long, scarcely exceeding the leaves; spikelets 2-flowered, the lemmas firm, acute.

Lima: Andes above Lima, 4,500 meters, *Weberbauer 5118,* type.

Poa fibrifera Pilger, Bot. Jahrb. 37: 380. 1906.

A lax slender perennial with fibrous base, forming loose clumps, the culms 30–60 cm. high; blades green, flat, elongate; panicles rather narrow but open, 7–20 cm. long, the slender branches ascending, naked below; spikelets green or purplish.

Ancash: Ocros, 3,300 meters, *Weberbauer 2662,* type.—Huánuco: Tambo de Vaca, 3,900 meters, wet mossy rocky uplands *4365, 4354.* Mito, 2,700 meters, sunny stream banks, *3363.*—Junín: La Oroya, 3,000 meters, along river, *Hitchcock 22176.*—Lima: Matucana, 2,400 meters, pastures and grassy slopes, *440, 367.*

Poa Gilgiana Pilger, Bot. Jahrb. 37: 507. 1906.

A rather coarse perennial, forming clumps, 40–100 cm. high; blades rather stiff, flat, 4 mm. wide, elongate; panicles open, 10–18 cm. long, purplish; spikelets 3-flowered, 7–8 mm. long.

Arequipa: Nevado de Chachani, 4,100 meters, open ash slopes, *Pennell 13300.*—Puno: Azángaro, 4,000 meters, calcareous soil, *Weberbauer 477,* type. Araranca, 4,100 meters, moist meadow, *Pennell 13476.*

Poa gymnantha Pilger, Bot. Jahrb. 56: Beibl. 123: 28. 1920.

Plants perennial, erect, forming dense clumps, 15–30 cm. high, rather pale green; blades stiff, erect, slender, involute, glabrous; panicles narrow and condensed, green, commonly 2–5 cm. long but sometimes as much as 8 cm.

Arequipa: Sumbai, 4,000 meters, *Weberbauer* 6905, type collection.—Huancavelica: Cordillera between Pisco and Ayacucho, 4,900 meters, *Weberbauer* 5440.—Puno: Ocapampa, *Shepard 59*. Also in Bolivia.

Poa horridula Pilger, Bot. Jahrb. 37: 506. 1906. *Melica expansa* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *P. androgyna* Hack. Repert. Sp. Nov. 6: 159. 1908.

An erect perennial, forming large clumps, often 1–1.5 meters high, pale green frequently decumbent at the base; blades flat, 8 mm. wide or less; panicles large and open, 10–20 cm. long or more, the slender branches whorled, widely spreading or often drooping or reflexed, naked toward the base; spikelets large, green or purple, glomerate on the branches.

Ancash: Between Samanco and Caraz, below Hacienda Cajabamba, 3,000–3,500 meters, *Weberbauer 3113*, type. Ocros, 3,200 meters, *Weberbauer 5806*.—Cuzco: Cuzco, *Hitchcock 22458*.—Huánuco: Chavanillo, 2,400 meters, dry bank, *1970*.—Junín: Cerro de Pasco, 4,200 meters, on wall, *Hitchcock 22251*.—Lima: Río Blanco, 3,600 meters, on slopes, *707, 646; Killip & Smith 21589*.—Puno: Azángaro, *Lechler 1734*, type of *Melica expansa*. Macusani, *Lechler 2682*. Tabina, *Lechler 2058*. Ecuador to Bolivia.

Poa humillima Pilger, Bot. Jahrb. 37: 378. 1906.

Plants densely cespitose, perennial; culms 2–3 cm. high, scarcely exceeding the leaves; blades 3–8 mm. long; panicles few-flowered, dense, 5–7 mm. long; spikelets 3–4-flowered; glumes 1.75–2 mm. long.

Junín: Near La Oroya, 4,300 meters, *Weberbauer 2602*, type.—Lima: Andes above Lima, 4,500 meters, *Weberbauer 5113*. Also in Bolivia.

Poa nigriflora Hitchc. Contr. U. S. Nat. Herb. 24: 330. 1927.

Perennial, densely cespitose, the culms about 60 cm. high, erect; blades stiff, involute, 10–15 cm. long, glabrous; panicles narrow and almost spike-like, 10–12 cm. long, the short branches ascending or

appressed; spikelets dark brown or fuscous, 5–8 mm. long, appressed, 2–3-flowered.

Junín: Huarón, 4,200 meters, rocky lake shore, *1135*, type.

Poa Pardoana Pilger, Bot. Jahrb. 37: 379. 1906.

Perennial, erect, glabrous, rather loosely cespitose; blades erect, narrow, folded or involute; panicles rather narrow but loose, nodding, 10–20 cm. long, the slender branches mostly in 2's, distant on the axis, becoming reflexed, the axis glabrous, the branches scabrous.

Cajamarca: Coimolache above Hualgayoc, 4,000 m., *Weberbauer 3975*, type. Also in Ecuador.

Poa pratensis L. Sp. Pl. 67. 1753.

An erect perennial with creeping rhizomes, the glabrous culms commonly 30–50 cm. high; blades green, flat, elongate; panicles open, 4–10 cm. long, green or purplish, the lower branches in whorls of 3–5, spreading.

Junín: Tarma, *Hitchcock 22171*. Native of Europe, but widely naturalized in America, and perhaps native in some regions.

This is the common bluegrass of the United States, which is planted extensively for pastures and lawns.

Poa scaberula Hook. f. Fl. Antarct. 378. 1847. *Dasypoa tenuis* Pilger, Bot. Jahrb. 25: 716. 1898.

Plants erect, cespitose, bright green, the culms 20–50 cm. high; blades elongate, narrow, flat; panicles narrow and condensed, 3–15 cm. long, the branches appressed, 1–2.5 cm. long, densely flowered to the base.

Cuzco: Ollantaitambo, 3,600 meters, moist, open or shaded places, common, *Hitchcock 22540*.—Junín: La Oroya, *Hitchcock 22186*.—Puno: Lake Titicaca, *Stuebel.60f*, type of *Dasypoa tenuis*. Extending to Argentina.

Poa subspicata (Presl) Kunth, Rév. Gram. 1: Suppl. 28. 1830. *Brizopyrum subspicatum* Presl, Rel. Haenk. 1: 281. 1830. *P. Jelskii* Hack. Oesterr. Bot. Zeitschr. 52: 454. 1902.

Perennial, cespitose, 20–30 cm. high; blades flat and rather lax, about 10 cm. long and 2 mm. wide; panicles narrow and dense, spike-like, 6–9 cm. long.

Cajamarca: Cutervo, *Jelski 392*, type of *P. Jelskii*.—Junín: Hacienda Atocsaico, *Hitchcock 22195*. Also in Ecuador. Type collected in Peru by Haenke.

Poa trivialis L. Sp. Pl. 67. 1753.

Perennial, lax, decumbent or spreading, sometimes producing stolons; sheaths somewhat roughened, the blades flat, elongate; panicles open and pyramidal, 3–8 cm. long.

Junín: La Quinhua, *Hitchcock 22266*. Native of Europe, but naturalized in temperate regions of America.

Poa adusta Presl, Rel. Haenk. 1: 271. 1830. Type collected in Peru by Haenke. The status of the plant is uncertain.

12. BRIZA L.

Slender annuals or perennials, the culms erect; blades flat; panicles open or condensed, the pedicels often capillary; spikelets several-flowered, broad, often cordate, the florets crowded and spreading horizontally, the rachilla glabrous, disarticulating above the glumes and between the florets; glumes subequal, broad, papery-chartaceous, with scarious margins; lemmas papery, cordate at the base, several-nerved; palea much shorter than the lemma.

Plants annual; spikelets triangular-ovate, 4–5 mm. long. . .*B. minor.*
Plants perennial; spikelets oblong or elliptic, 2–3 mm. long.
B. monandra.

Briza monandra (Hack.) Pilger, Notizbl. Bot. Gart. Berlin 10: 725. 1929. *Calotheca stricta* var. *Mandoniana* Griseb. Abh. Goett. 24: 289. 1879. *Poa monandra* Hack. Oesterr. Bot. Zeitschr. 52: 376. 1902. *B. Mandoniana* Henr. Med. Rijks Herb. 40: 70. 1921.

Plants slender, forming dense tufts, 90 cm. high or less; blades mostly basal and 2–3 mm. wide; panicles 5–10 cm. long, usually loose and nodding; spikelets on long slender pedicels, turgid, tinged with purple.

Huánuco: Fifteen miles southeast of Huánuco, 3,150 meters, in open meadow between streams, *2098*. Mito, at edge of thickets or on open slopes, 2,700 meters, *3316*, *1433*, *1728*.—Amazonas: Chachapoyas, *Mathews 3237*. Colombia to Argentina.

Briza monandra (Hack.) Pilger, var. **condensata** Standl. Field Mus. Bot. 8: 298. 1931.

Differing from the usual form in its stouter habit and condensed spike-like panicle.

Junín: Huarón, on rock ledges, 4,200 meters, *1154*, type.

Briza minor L. Sp. Pl. 70. 1753.

A delicate annual 30–50 cm. high; blades flat, scabrous; panicles loose and open; spikelets on very long and capillary pedicels, often tinged with purple.

Huánuco: Open meadow between streams, 15 miles southeast of Huánuco, 3,150 meters, *2098*.—Lima: Lima, *Hitchcock 22427*. A native of Europe, but naturalized in many parts of South America; sometimes cultivated for ornamental purposes.

The following grasses were described by Presl as coming from Peru: *Chascolytrum spicigerum* Presl (Rel. Haenk. 1: 282. 1830), *C. rufum* Presl (op. cit. 258), *Calotheca macrostachya* Presl (op. cit. 268), *C. reniformis* Presl (op. cit. 268), *C. microstachya* Presl (loc. cit.), *Panicum poaemorphum* Presl (op. cit. 310). All were reported from the region of Huánuco. According to Hitchcock (Contr. U. S. Nat. Herb. 24: 335. 1927), all are referable to the genus *Briza*, but since none of them have been found in Peru by more recent collectors, it is suspected that the plants are not Peruvian.

13. ERAGROSTIS Host

Annuals or perennials with long narrow blades; panicles open or contracted and spike-like; spikelets few–many-flowered, the florets closely imbricate, the rachilla disjointing above the glumes and between the florets, or continuous, the lemmas deciduous, the paleas persistent; glumes more or less unequal, acute or acuminate, 1-nerved, the second rarely 3-nerved; lemmas acute or acuminate, keeled or rounded on the back, 3-nerved; palea 2-nerved.

Annuals.

Palea ciliate on the keels, the cilia as long as the width of the lemma. Panicles dense and spike-like.....*E. ciliaris.*

Palea not conspicuously ciliate on the keels.

Lemmas glandular on the keel, 1 mm. wide or more when folded. *E. cilianensis.*

Lemmas not glandular, commonly less than 1 mm. wide when folded.

Panicle elongate, up to 40 cm. long, contracted, the minute spikelets crowded or glomerate.....*E. glomerata.*

Panicle not both elongate and dense.

Panicle oval or oblong, dense, 1–5 cm. long, spike-like. *E. peruviana.*

Panicle open, often very lax.
Panicles dark purple, the branches implicate at maturity. *E. nigricans.*
Panicles green or lead-colored, not implicate.
Spikelets 1 mm. wide..... *E. pilosa.*
Spikelets nearly 2 mm. wide.
Panicles more or less pilose in some of the axils. *E. mexicana.*
Panicles glabrous in the axils..... *E. limbata.*

Perennials.
Panicles dense and spike-like.
Panicles 3–6 cm. long, attenuate and interrupted below. *E. Weberbaueri.*
Panicles elongate..... *E. attenuata.*
Panicles open, or narrow but not dense and spike-like.
Lemmas acuminate. Spikelets somewhat appressed along the panicle branches..... *E. acutiflora.*
Lemmas acute or acutish.
Panicles narrow, the branches appressed or ascending, if spreading, short and closely flowered.
Branches of the panicle rather distant, sometimes naked at the base for as much as 1 cm., commonly less than 5 cm. long..... *E. lurida.*
Branches of the panicle ascending or appressed. *E. pastoensis.*
Panicles open and often diffuse.
Branches spreading, naked at the base for 2–5 cm., rather closely flowered toward the end *E. Montufari.*
Branches rather evenly flowered throughout.
Culms robust, up to 1.5 meters tall and 6 mm. thick at the base..... *E. magna.*
Culms comparatively low and slender, rarely as much as 1 meter tall.
Spikelets mostly with more than 8 flowers *E. patula.*
Spikelets mostly 3–5-flowered.
Rachilla conspicuously pilose..... *E. Pilgeriana.*
Rachilla glabrous.
Lemmas 3 mm. long..... *E. carazensis.*
Lemmas 2 mm. long..... *E. lugens.*

Eragrostis acutiflora (HBK.) Nees, Agrost. Bras. 501. 1829. *Poa acutiflora* HBK. Nov. Gen. & Sp. 1: 161. 1816.

Plants erect, about 60 cm. high; blades flat or loosely involute, very narrow; panicles oblong, 10–20 cm. long, the branches rather distant and ascending; spikelets 5 mm. long, pale; lemmas 2 mm. long, the tips not appressed.

San Martín: Tarapoto, *Williams 5791*. Bolivia to Brazil and Central America.

Eragrostis attenuata Hitchc. Contr. U. S. Nat. Herb. 24: 340. 1927.

Plants cespitose, the culms prostrate or ascending, 20–60 cm. long; blades pilose, 1 mm. wide; panicles very narrow and spike-like, 40 cm. long or less, purplish; spikelets 3–4-flowered, 2 mm. long.

Arequipa: Mollendo, sandy hill slopes, *Hitchcock 22424*, type collection.

Eragrostis carazensis Pilger, Bot. Jahrb. 56: Beibl. 123: 27. 1920.

Plants erect, the blades long and slender, involute; panicle open, elliptic, 25 cm. long; spikelets yellowish green, 4–6 mm. long, 3–7-flowered; lemmas obtuse, 2.5 mm. long.

Ancash: Type collected at Caraz, *Weberbauer 2999*.

Eragrostis cilianensis (All.) Link ex Vign. Lut. Malpighia 18: 386. 1904. *Poa cilianensis* All. Fl. Pedem. 2: 246. 1785. *E. major* Host, Icon. Gram. Austr. 4: 14. 1809. *E. megastachya* Link, Hort. Berol. 1: 187. 1827.

Plants often densely branched from the base, erect or more commonly spreading, ill-scented; blades long and narrow; panicles rather dense, 2–14 cm. long, greenish or often whitish; spikelets many-flowered, 5–15 mm. long, 3 mm. wide, the florets closely imbricate; pedicels sparingly glandular.

Lima: San Bartolomé, 1,500 meters, *Weberbauer 5284*.—Moquehua: Mountains between Moquehua and Torata, 2,000 meters, *Weberbauer 7438*.—Piura: Pariñas Valley, along watercourses, not uncommon, *Haught F170, 235;* April 12, 1929, *Haught*.—Tumbez: Zorritos, 100 meters, *Weberbauer 7743*.—Without locality, *Weberbauer 5927*. Believed to be a native of Europe, but now widely naturalized in America.

Eragrostis ciliaris (L.) Link, Hort. Berol. 1: 192. 1827. *Poa ciliaris* L. Syst. Nat. ed. 10. 2: 875. 1759.

Plants erect or prostrate, the culms very slender and wiry, 10–60 cm. long; blades flat, 2–3 mm. wide; panicles dense, sometimes interrupted, pale green, 5–15 cm. long; spikelets subsessile, crowded, 2 mm. long, 6–8-flowered.

Junín: Colonia Perené, *Hitchcock 22074*.—Lima, *Wilkes Exped.*—Piura: Pariñas Valley, *Haught F169*. Widely distributed in the warmer parts of both hemispheres; believed to be introduced in America.

Eragrostis ciliaris is one of the most common weedy grasses of the tropical American lowlands.

Eragrostis glomerata (Walt.) L. H. Dewey, Contr. U. S. Nat. Herb. 2; 543. 1894. *Poa glomerata* Walt. Fl. Carol. 80. 1788.

Plants stout, sometimes 2 m. high, freely branched; blades elongate; panicles up to 40 cm. long, narrow and contracted, dense, pale, the spikelets 2 mm. long, 4–6-flowered, the lemmas scarcely 1 mm. long.

Piura: Piura, *Spruce 6429*. Uruguay to the southeastern United States.

Eragrostis limbata Fourn. Mex. Pl. 2: 116. 1886.

Erect or spreading, branched from the base, 70 cm. high or less, the blades flat; panicles purplish or lead-colored, open, usually less than half the height of the plant, the branches rather stiffly spreading; spikelets 8–12-flowered, oblong, 5–6 mm. long; lemmas 2 mm. long, acute.

Arequipa: Tingo, rocky open slopes, 2,200 m., *Pennell 13109*.—Lima: Matucana, dry stony northern slope, 2,400 m., *224*.—Moquehua: Mount Estuquiña, 1,900 m., *Weberbauer 7447*. Bolivia to Mexico.

Eragrostis lugens Nees, Agrost. Bras. 505. 1829.

Erect, cespitose, 30–50 cm. high; sheaths pilose, the blades flat or involute; panicles diffuse, fragile, usually more than half the height of the plant; spikelets 5–10-flowered; lemmas obscurely nerved, convex on the back, acute, 1.3 mm. long.

Cuzco: Ollantaitambo, *Hitchcock 22517*.—Puno: Juliaca, *Harlan* in 1914. Argentina to southwestern United States.

Eragrostis lurida Presl, Rel. Haenk. 1: 276. 1830.

Plants erect or prostrate, densely cespitose, 1 m. tall or less, the blades very narrow; panicles narrow, lead-colored, 30 cm. long or shorter, the primary branches distant, stiffly spreading or ascending.

Cuzco: Open ground, Cuzco, *Hitchcock 22463*. Ollantaitambo, rocky hillside, *Hitchcock 22518*.—Junín: Tarma, heavy stony soil in washes, 2,100 m., *987*; open hillside, *Killip & Smith 21793; Hitchcock 22162*.—Lima: Matucana, loose dry slopes, 2,400 m., *251, 252*. Ecuador to Bolivia; described from Peru.

Eragrostis magna Hitchc. Contr. U. S. Nat. Herb. 24: 341. 1927.

Culms forming large clumps; sheaths glabrous, the blades flat or involute, 7 mm. wide or less, glabrous beneath, villous above; panicle narrow and rather loose, 30–50 cm. long, densely villous in the axils of the main branches; spikelets brown or lead-colored, 7–10 mm. long, 7–10-flowered.

Huánuco: Huacachi, 1,950 m., steep rocky grassland, *4069*, type.

Eragrostis mexicana (Lag.) Link, Hort. Berol. 1: 190. 1827. *Poa mexicana* Lag. Gen. & Sp. Nov. 3. 1816.

Plants slender, often much branched from the base, 1 m. high or less; panicles large and often drooping, gray or lead-colored, 15–20 cm. long; spikelets linear-oblong, 8–12-flowered, 5–7 mm. long; lemmas 1.7 mm. long.

Lima: Lurín, sandy lomas by the sea, *5954*. Río Chillón near Viscas, 1,900 m., open rocky slope, *Pennell 14462*. Chile to southwestern United States.

Eragrostis Montufari (HBK.) Steud. Nom. Bot. ed. 2. 1: 563. 1840. *Poa Montufari* HBK. Nov. Gen. & Sp. 1: 159. 1816. *E. Buchtienii* Hack. Repert. Sp. Nov. 6: 157. 1908.

Plants slender, erect or spreading, 30–80 cm. high, the sheaths villous or glabrous, the blades flat or involute; panicles open, 10–25 cm. long, the branches spreading or ascending, the spikelets appressed along the upper half.

Cuzco: Cuzco, *Hitchcock 22490*.—Huánuco: Mito, open slope, 2,700 m., *1425*.—Junín: La Merced, *Hitchcock 22131*. Tarma, *Hitchcock 22150*. Ecuador to Bolivia.

Eragrostis nigricans (HBK.) Steud. Nom. Bot. ed. 2. 1: 563. 1840. *Poa nigricans* HBK. Nov. Gen. & Sp. 1: 159. 1816.

Plants slender, much branched from the base, the culms decumbent or sometimes erect, 60 cm. long or less, the blades long and narrow; panicles 20 cm. long or less, rather narrow, the short main branches spreading, rather densely flowered; spikelets small and narrow, commonly dark purple but sometimes green.

Amazonas: Chachapoyas, *Mathews 3242.*—Arequipa: Arequipa, open rocky slopes, 2,800 m., *Pennell 13249*; bare gravelly knolls, 2,300 m., *Pennell 13053.* Tiabaya, open sandy flats along river, 2,100 m., *Pennell 13152.*—Cuzco: Cuzco, *Hitchcock 22497.*—Junín: La Merced, *Hitchcock 22130.*—Lima: Matucana, dry hard soil, northern slope, 2,400 m., *223.*—Moquehua: Mount Estuquiña, 1,800 m., *Weberbauer 7447a.* Torata, 2,200 m., *Weberbauer 7405.*—Tacna: Candarave, 2,900 m., *Weberbauer 7384.* Ecuador to Bolivia.

Eragrostis pastoensis (HBK.) Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2, pt. 1: 71. 1836. *Poa pastoensis* HBK. Nov. Gen. & Sp. 1: 160. 1916. *E. contracta* Pilger, Bot. Jahrb. 37: 376. 1906.

Plants erect or spreading, cespitose, 1 m. high or less; blades erect, involute-setaceous at the tip; panicles narrow, contracted, almost spike-like, 30 cm. long or less, long-pilose in the axils; spikelets lead-colored.

Ancash: Ocros, *Weberbauer 2663.* Chiquián, 3,200 m., *Weberbauer 2841*, type of *E. contracta.*—Cuzco: Ollantaitambo, *Hitchcock 22522.* Colombia to Bolivia.

Eragrostis patula (HBK.) Steud. Nom. Bot. ed. 2. 1: 564. 1840. *Poa patula* HBK. Nov. Gen. & Sp. 1: 158. 1816.

Plants densely tufted, the slender culms erect or decumbent, 60 cm. high or less, the blades narrow and elongate; panicles 8–12 cm. long, the branches spreading, sometimes flexuous; spikelets narrow, dark.

Huánuco: Huánuco, loose shale outcrop, 2,100 m., *3516.*—Lima: Matucana, 2,400 m., gravelly river flat, *2926.*—Without locality, *Weberbauer 5521.* Also in Ecuador.

Eragrostis peruviana (Jacq.) Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. 1: 396. 1830. *Poa peruviana* Jacq. Coll. Bot. 1: 107. 1786. *E. peruviana* var. *brachythyrsa* Pilger, Bot. Jahrb. 37: 375. 1906.

Plants pubescent, spreading, much branched from the base, the decumbent culms 10–40 cm. long; blades very narrow, flat; panicles spike-like, pale or dark green, mostly 1–5 cm. long.

Arequipa: Mollendo, common on sandy hills, *Hitchcock 22351.*—Lima: Chorillos, loose stony slopes of seaside hills, *5874.* Lurín, 60 m., sandy lomas along the sea, *5925.* Also in Chile.

Eragrostis Pilgeriana Hitchc. Contr. U. S. Nat. Herb. 24: 342. 1927. *E. andicola* Pilger, Bot. Jahrb. 37: 377. 1906, non Fries,

1905. *E. andicola* f. *humilior* Pilger, loc. cit. *E. andicola* var. *robustior* Pilger, loc. cit.

Plants erect, the slender culms 30–50 cm. long; blades setaceous-involute; panicles open, elliptic-oblong, 10–15 cm. long; spikelets lead-colored, 3–8-flowered, on slender flexuous pedicels; lemmas 3 mm. long; rachis pilose.

Ancash: Between Samanco and Caraz, *Weberbauer 3114*, type; *3036* (type of f. *humilior*). Ocros, *Weberbauer 2746*, type of var. *robustior*.

Eragrostis pilosa (L.) Beauv. Ess. Agrost. 162. 1812. *Poa pilosa* L. Sp. Pl. 68. 1753.

Plants much branched from the base, the culms slender, erect or spreading, usually 30–60 cm. long; blades long and slender, the sheaths pilose at the summit; panicles rather open, about one-third the height of the plant, dark; spikelets 4–6 mm. long.

Lima: Chosica, neglected banana plantation, 900 m., *551*. Matucana, rock slopes, *451*, *225*, *393*, *164*. Widely distributed in both hemispheres.

Eragrostis Weberbaueri Pilger, Bot. Jahrb. 37: 375. 1906.

Plants densely cespitose, the culms stout, 20–40 cm. high, erect or ascending; blades slender, involute-tipped, ascending or spreading; panicles spike-like, pale green, 3–6 cm. long, sometimes interrupted below.

Ancash: Between Samanco and Caraz, *Weberbauer 3189*, type.—Arequipa: Below Arequipa, 2,000 m., *Weberbauer 6836*. Cotahuasi, 2,600 m., *Weberbauer 6870*. Tiabaya, open sandy slopes, 2,100 m., *Pennell 13065*.—Lima: Matucana, in granite rocks on dry slope, 2,400 m., *303*.

Eragostis tristis Jedw. Bot. Archiv Mez 5: 205. 1924.—The species was based in part upon a specimen collected by Meyen in Tacna. According to Hitchcock (Contr. U. S. Nat. Herb. 24: 344. 1927), the name may be a synonym of *Eragrostis nigricans*.

Eragostis stencoclada Presl (Rel. Haenk. 1: 278. 1830), originally described as from Peru, is stated to have come really from California.

14. DISTICHLIS Raf. Saltgrass

Plants perennial, often with long creeping rhizomes, the blades short and narrow, the panicles small and dense; plants dioecious;

spikelets compressed, several-flowered, the glumes and lemmas firm, keeled, the lemmas faintly many-nerved.

Panicles with only 1–3 spikelets; plants mostly 5 cm. high or less. *D. humilis.*

Panicles with more than 3 spikelets; plants erect, mostly 10–20 cm. high..... *D. spicata.*

Distichlis humilis Philippi, Anal. Mus. Nac. Chile Bot. 8: 86. 1891.

Culms densely crowded, suberect; blades involute, 1–2 cm. long, pale; spikelets pale, about 6 mm. long, scarcely as long as the leaves.

Cuzco: Chuquibambilla, along paths, 3,880 m., *Hitchcock 22450.*—Puno: Puno, *Shepard 128.* Ranging to northern Argentina and Chile.

Distichlis spicata (L.) Greene, Bull. Calif. Acad. 2: 415. 1887. *Uniola spicata* L. Sp. Pl. 71. 1753. *Poa thalassica* HBK. Nov. Gen. & Sp. 1: 157. 1816. *D. maritima* Raf. Journ. de Phys. 89: 104. 1819. *Uniola thalassica* Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. 1: 359. 1830. *D. thalassica* Desv. in Gay, Fl. Chil. 6: 397. 1853.

Plants with long creeping rhizomes, the culms erect; leaves conspicuously distichous, the sheaths strongly overlapping, the blades short, spreading, narrow, sharp-pointed; panicles small and dense, the spikelets pale.

Arequipa: Arequipa, *Hitchcock 22429.*—Libertad: Salaverry, on sands above beach, *47.*—Lima: Pacasmayo, *Rose 18518.* Widely distributed in America, on seacoasts or in saline soil.

15. PHRAGMITES Adans. Reed

Coarse perennials with broad flat blades and large terminal panicles; spikelets several-flowered, the rachilla covered with long silky hairs, disjointing above the glumes and at the base of each joint between the florets, the lowest floret staminate or neuter; glumes 3-nerved, or the upper 5-nerved, unequal, lanceolate, acute, the first half as long as the second; lemmas narrow, long-acuminate, glabrous, 3-nerved.

Phragmites communis Trin. Fund. Agrost. 134. 1820. *Arundo Phragmites* L. Sp. Pl. 81. 1753.

Plants stout, commonly 2–4 m. high, producing stolons and rhizomes, often forming large colonies; blades 30–40 cm. long, 1–3 cm. wide; panicles plume-like, usually purplish, 20–40 cm. long.

Lima: Obrajillo, *Wilkes Exped.*—Piura: Piura, *Spruce 6434.* Generally distributed in temperate and often in tropical regions of the world; growing chiefly in marshes. "Carrizo," "soccos."

The stems are much used locally for making roofs and as framework for mud walls, as well as for many other purposes.

16. CORTADERIA Stapf

Usually large and coarse perennials, the leaves commonly crowded at the base; blades long and narrow, mostly rough on the margins; inflorescence paniculate; spikelets several-flowered, the rachilla disjointing near the base of the internodes, the lower shorter part glabrous, the longer upper part bearded; rachilla and florets clothed with long hairs; lemma tapering into a slender point or awn, or awned between the teeth of the bifid apex.

Spikelets unisexual, the plants dioecious; lemmas tapering to a soft and slender, scarcely awned tip.....*C. rudiuscula.*

Spikelets perfect; lemmas conspicuously awned.

Apex of the lemma bifid, the teeth terminated by capillary awns. *C. bifida.*

Apex of the lemma entire or with 1–2 short teeth at the base of the awn.

Blades densely villous at the base; old sheaths not coiled; plants mostly 20–40 cm. high.....*C. sericantha.*

Blades not villous; old sheaths becoming flat and spiral at the base of the culm; plants usually 1–2 m. high.....*C. nitida.*

Cortaderia bifida Pilger, Bot. Jahrb. 37: 374. 1906. *C. aristata* Pilger, op. cit. 375. 1906.

Plants large and coarse, 1–2 m. high; blades rather rigid, the broad pale sheaths becoming flat and curled in age; panicles mostly 15–20 cm. long, dark, rather lax, the long slender awns conspicuous.

Huánuco: Mito, 3,000 m., sunny wet slopes, *1822.* Mountains southwest of Monzón, 3,400 m., *Weberbauer 3349,* type of *C. aristata.* —Puno: Between Tambo Yuncacoya and Ramospata, stony soil along stream, 2,000–2,400 m., *Weberbauer 1328,* type. Ecuador to Bolivia.

Cortaderia nitida (HBK.) Pilger, Bot. Jahrb. 37: 375. 1906. *Arundo nitida* HBK. Nov. Gen. & Sp. 1: 149. 1816. *Gynerium nitidum* Pilger, Bot. Jahrb. 27: 31. 1899.

Plants erect, tufted, 1 m. high or often lower; blades narrow and elongate, rather stiff, green; panicles brownish, 10–20 cm. long.

Cuzco: Tambo Tres Cruces, 3,760 m., *Weberbauer 6924*.—Junín: Between Culnai and Obrajillo, *Wilkes Exped.* Ranging to Colombia and Venezuela.

Cortaderia rudiuscula Stapf, Gard. Chron. III. 22: 396. 1897.

Plants tall and coarse, 1–2 m. high; basal blades very numerous, sometimes 1.5 m. long, usually less than 1 cm. wide, firm and tough, very scabrous on the margins; panicles plume-like, pale, yellowish or purplish, 30–60 cm. long, dense, the branches often drooping.

Arequipa: Arequipa, 3,100 m., along stream in canyon, *Pennell 13233*.—Cuzco: Cuzco, *Hitchcock 22475*.—Huánuco: Río Marañón below Chavanillo, 2,350 m., moist swales of canyon side, *2307*.—Junín: Gollarisquisga, *Hitchcock 22306*.—Lima: Matucana, 2,400 m., among rocks along river, *2936*. Ecuador to Argentina and Chile.

Some of the collections cited were determined originally as *C. quila* (Nees & Mey.) Stapf.

Cortaderia sericantha (Steud.) Hitchc. Contr. U. S. Nat. Herb. 24: 348. 1927. *Danthonia sericantha* Steud. Syn. Pl. Glum. 1: 246. 1854.

Plants erect, perennial, 15–30 cm. high, forming tussocks; blades firm, involute, flat at the base; lower part of the summit of the sheaths densely villous-felted; panicles ovoid or oblong, dense and spike-like, 3–13 cm. long, rather dark.

Huánuco: Six miles south of Mito, 3,300 m., grassy upland, *1890*. Ecuador and Colombia.

In general appearance this plant is conspicuously different from the other species listed.

17. GYNERIUM H. & B.

Coarse tall erect reeds, dioecious; spikelets several-flowered, the pistillate with long-attenuate glumes and with smaller long-silky lemmas; staminate spikelets with shorter glumes and glabrous lemmas.

Gynerium sagittatum (Aubl.) Beauv. Ess. Agrost. 138. 1812. *Saccharum sagittatum* Aubl. Pl. Guian. 1: 50. 1775. *G. saccharoides* H. & B. Pl. Aequin. 2: 112. *pl. 115*. 1809.

Plants very large, sometimes 10 m. high, the thick culms clothed below with old sheaths; blades about 2 m. long and 4–6 cm. wide,

forming a large fan-shaped summit to the sterile culms; panicles pale, plume-like, 1 m. long or more, the main axis erect, the branches drooping.

Junín: La Merced, along stream, 600 m., *5251*. Colonia Perené, *Hitchcock 22123*.—Lima: Callao, *Wilkes Exped.* Generally distributed in tropical America. "Caña brava," "pintoc."

This is a characteristic plant of the swamps of tropical American lowlands, often forming dense stands in them or along stream banks. The thick heavy stems are used for much the same purposes as bamboo, and in some regions they are utilized in large quantities for the sides of huts, or as a substitute for lath in the better class of houses. The stems were much used formerly for making arrow shafts.

18. MELICA L.

Slender perennials with narrow elongate blades, the spikelets arranged in panicles; spikelets 2–few-flowered, falling entire, the upper 2–3 lemmas sterile, smaller and convolute as a club-shaped mass; glumes somewhat unequal, thin and papery, with conspicuous scarious margins; lemmas convex, several-nerved, usually awnless.

Melica scabra HBK. Nov. Gen. & Sp. 1: 164. 1816. *M. pyrifera* Hack. Oesterr. Bot. Zeitschr. 52: 307. 1902. *M. majuscula* Pilger, Notizbl. Bot. Gart. Berlin 8: 453. 1923. *M. cajamarcensis* Pilger, op. cit. 454. 1923. *M. Weberbaueri* Pilger, op. cit. 455. 1923. *M. Weberbaueri* var. *decolorata* Pilger, loc. cit. 1923. *M. Weberbaueri* var. *violascens* Pilger, loc. cit. 1923.

Plants weak, decumbent, branched, the culms 1 m. long or less; sheaths retrorsely scabrous, the blades flat, 3–4 mm. wide, green; panicles narrow but open, 10–20 cm. long, the branches ascending or spreading, floriferous to the base; spikelets pale or purple, on flexuous pedicels, usually with 2 perfect florets.

Ancash: Ocros, *Weberbauer 2750*. Caraz, *Weberbauer 3034*, type of *M. Weberbaueri* var. *decolorata*.—Cajamarca: Cayacati, *Jelski 590*, type of *M. pyrifera*). Prov. Hualgayoc, *Weberbauer 4138*, type of *M. cajamarcensis*. Below San Pablo, 2,300 m., *Weberbauer 3864*.—Cuzco: Cuzco, *Weberbauer 4877*, type of *M. majuscula*. Sacsahuamán, 3,500 m., rocky stream bank, *Pennell 13546*.—Huánuco: Llata, 2,100 m., pendent from shaded river cliff, *2232*.—Junín: Yanahuanca, 3,000 m., *1223*.—Libertad: Hacienda Angasmarca, 2,900 m., *Weberbauer 7198*, type of *M. Weberbaueri*.—Lima: Matucana, grassy slopes, 2,400 m., *454, 365, 281*; *Weberbauer 110*, type of *M. Weberbaueri* var. *violascens*. Ecuador to Bolivia.

19. ANTHOCHLOA Nees

Low perennials, the blades narrow, elongate, the panicles dense and spike-like; spikelets few-flowered, subsessile and imbricate on a simple axis, the rachilla disjointing above the glumes and between the florets; glumes similar to the lemmas but much smaller; lemmas thin-membranaceous, fan-shaped, whitish and petal-like; palea narrower than the lemma, hyaline.

Anthochloa lepidula Nees & Mey. in Meyen, Reis. Erd. 2: 14. 1835. *A. lepida* Nees & Meyen, Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 33. 1841.

A low alpine plant, forming dense clumps, soft and lax, 10 cm. high or less; blades erect or spreading, 1.5 mm. wide; panicles pale, ovoid, 1–1.5 cm. long and nearly as broad, shorter than the leaves.

Arequipa: Nevado de Chachani, 4,500 meters, crevices of rocks, *Pennell 13316*.—Huancavelica: Cordillera between Pisco and Ayacucho, 4,900 meters, *Weberbauer 5439*.—Lima: Casapalca, 4,800 meters, on decaying igneous rock, *825*.—Moquehua: Carumas, 4,500 meters, stony places, *Weberbauer 7319*.—Puno: Lake Titicaca, *Meyen*, type. Also in Bolivia.

A handsome low grass, easily recognized by the soft paper-like glumes and lemmas.

20. ORTHOCLADA Beauv.

A large perennial with broad flat blades; panicles large and diffuse; spikelets jointed below the glumes, 1-flowered with a prolongation of the rachilla, or 2-flowered, the florets distant; glumes and lemmas acuminate.—The genus consists of a single species.

Orthoclada laxa (L. Rich.) Beauv. Ess. Agrost. 70, 149. 1812. *Aira laxa* L. Rich. Act. Soc. Hist. Nat. Paris 1: 106. 1792. *O. rariflora* Beauv. Ess. Agrost. 70. 1812.

Plants stoloniferous, the culms ascending, often more than 1 meter long; blades slender-petioled, oblong-lanceolate, 12–15 cm. long and 2.5–4 cm. wide, glabrous; panicle 30–60 cm. long, the long capillary branches at first erect, widely spreading in age, bearing 1–few spikelets at the ends.

Junín: Colonia Perené, in forest, 600 meters, *Killip & Smith 25158*. Puerto Bermúdez, in thickets, 375 meters, *Killip & Smith 26602*.—Loreto: Fortaleza, Yurimaguas, in forest, *Williams 4372*. Caballo-cocha, *Williams 2022, 2494, 2249*. Pebas, *Williams 1704,*

1934. Puerto Arturo, Yurimaguas, edge of forest, *Williams 5026, 5172*. Between Río Nanay and Río Napo, *Williams 715*. Iquitos, *Killip & Smith 27058*. Between Yurimaguas and Balsapuerto, *Killip & Smith 28243*. Mishuyacu, in clearing, *Klug 998, 211*.—Puno: Sangabán, *Lechler 2432*. Ranging to Brazil and Mexico.

21. ZEUGITES Schreb.

Slender perennials, the blades broad and thin; panicles terminal; spikelets few-several-flowered, the lowest floret perfect, the others staminate, the rachilla joint between the perfect and staminate florets elongate; glumes and fertile lemma broad, herbaceous, with transverse veins between the nerves, obtuse or truncate, the glumes half as long as the lemma; sterile lemmas acute.

Zeugites mexicana (Kunth) Trin. ex Steud. Nom. Bot. ed. 2. 2: 798. 1841. *Despretzia mexicana* Kunth, Rév. Gram. 2: 485. *pl. 157*. 1831. *Senites mexicana* Hitchc. Contr. U. S. Nat. Herb. 17: 370. 1913.

Plants spreading, very slender, much branched, the culms 60 cm. long or more; blades ovate, 1.5–3.5 cm. long, 1–1.5 cm. wide, flat, glabrous; panicles small and few-flowered, the spikelets awnless, on long slender pedicels; glumes 2 mm. long; staminate florets 1–2, about 3 mm. long.

Cuzco: Marcapata Valley near Chilechile, border of thicket, 2,500 meters, *Weberbauer 7866*.—Huánuco: Panao, 2,700 meters, shrubby slope, *3621*. Ranging to Brazil and Mexico.

22. COTTEA Kunth

Slender perennials with elongate narrow flat blades and narrow, rather loose panicles; spikelets several-flowered; lemmas rounded on the back, villous below, prominently 9–11-nerved, some of the nerves extending into awns of irregular length and partly into awned teeth.

Cottea pappophoroides Kunth, Rév. Gram. 1: 84. 1829.

Plants erect, much branched from the base, the culms mostly 30–60 cm. high; blades 4–5 mm. wide; panicles pale or commonly purplish, 10–15 cm. long; spikelets about 1 cm. long, the awns conspicuous.

Arequipa: Cotahuasi, 2,600 meters, *Weberbauer 6872*.—Huánuco: Huánuco, rock ledges, 2,100 meters, *3240*.—Lima: Mountains near

Chosica, 1,300 meters, *Weberbauer 5339*. Chosica, sandy rocky slope, 900 meters, *2876*.—Piura: Near Cabo Blanco, *Haught F168*.—Without locality: *Weberbauer 6514, 5346*. Ecuador to Argentina; also in Mexico and southwestern United States; originally described from Peru, without locality or name of collector.

23. PAPPOPHORUM Schreb.

Small or large perennials with long narrow blades, the panicles narrow, often spike-like; spikelets 1–3-flowered, the upper sterile; glumes thin, subequal; lemma more or less indurate, dissected at the summit into about 13 slender awns, the second and third florets reduced, closely appressed to the palea, the awns of all the florets together forming a pappus-like crown, falling attached to the fruit.

Culms 1 meter high or more; panicles pale or purple, commonly 20–30 cm. long or more ..... *P. alopecuroideum*.

Culms usually less than 30 cm. high; panicles lead-colored, mostly 2–5 cm. long ..... *P. Wrightii*.

Pappophorum alopecuroideum Vahl, Symb. Bot. 3: 10. 1794. *P. laguroideum* Schrad. ex Schult. Mant. 3: 342. 1824.

Plants stout, forming clumps, glabrous; blades involute; panicles feathery from the numerous long and delicate awns.

Huánuco: Huánuco, gravelly gulch, 2,100 meters, *3238*.—Without locality: *Weberbauer 6462*. Argentina to Mexico and the West Indies.

Pappophorum Wrightii Wats. Proc. Amer. Acad. 18: 178. 1883.

A low perennial, forming dense clumps, the slender culms erect or decumbent; blades narrow and involute; panicles scarcely 1 cm. thick.

Arequipa: Cotahuasi, 2,600 meters, *Weberbauer 6869*. Tiabaya, 2,100 meters, *Pennell 13058*. Tingo, 2,200 meters, open, sandy and rocky slopes, *Pennell 13114*.—Moquehua: Mountains between Moquehua and Torata, 2,000 meters, *Weberbauer 7439*. Also in Bolivia, Mexico, and southwestern United States.

24. AGROPYRON Gaertn.

Erect perennials with narrow blades; spikelets arranged in simple terminal spikes, few–several-flowered, commonly solitary, sessile, placed flatwise at each joint of a continuous rachis, the

rachilla disjointing above the glumes and between the florets; glumes 2, equal, several-nerved, commonly shorter than the first lemma, acute or awned, rarely obtuse or notched; lemmas convex, 5–7-nerved, usually acute or awned from the apex. The species listed here are the only ones known from the central Andes.

Lemmas not awned; glumes prominently several-nerved, more than 1 cm. long.....*A. attenuatum.*

Lemmas short-awned; glumes inconspicuously few-nerved, less than 1 cm. long.....*A. breviaristatum.*

Agropyron attenuatum (HBK.) R. & S. Syst. Veg. 2: 751. 1817. *Triticum attenuatum* HBK. Nov. Gen. & Sp. 1: 180. 1816.

Plants erect, tufted, about 1 meter high, the culms decumbent or with rhizomes; blades 2–4 mm. wide, flat or involute, puberulent; spikes dense, 10–15 cm. long, sometimes one-sided.

Junín: Chinche, 3,450 meters, grassy slope, *1281.* La Oroya, 3,600 meters, limestone river cliffs, *957.* Also in Ecuador and Bolivia.

The specimens cited were determined originally as *A. tenerum* Vasey.

Agropyron breviaristatum Hitchc. Contr. U. S. Nat. Herb. 24: 353. 1927.

A loosely cespitose perennial; culms 1 meter high or less; blades flat, scaberulous, 2–4 mm. wide; spikes 10–20 cm. long; spikelets 3–5-flowered, 1–1.5 cm. long.

Cuzco: Side of a ravine north of Cuzco, *Hitchcock 22462,* type collection. Ollantaitambo, *Hitchcock 22538.*—Junín: Gollarisquisga, *Hitchcock 22329.* Also in Bolivia.

25. ELYMUS L. Wild rye

Plants perennial, erect, the blades long and narrow; spikelets in dense terminal spikes, 2–6-flowered, sessile in pairs at each node of a continuous rachis; lemmas rounded on the back or nearly terete, obscurely 5-nerved, commonly awned from the tip.

Elymus angulatus Presl, Rel. Haenk. 1: 264. 1830. *E. andinus* Trin. Linnaea 10: 304. 1836.

Plants glabrous, the culms 1 meter high or less, sometimes with spreading base; blades flat, 2–6 mm. wide; spike erect or nodding, 7–15 cm. long, 1 cm. thick, the awns 5–15 mm. long.

Junín: Cerro de Pasco, *Hitchcock 22267*. Gollarisquisga, *Hitchcock 22319*. La Quinhua, *Hitchcock 22278*. Baños, *Wilkes Exped.*— Lima: Río Blanco, 3,600 meters, on western slope, *650; Killip & Smith 21549*. Extending to Argentina. Type collected in Peru by Haenke.

26. HORDEUM L. Barley

Annuals or perennials, erect, the blades long and narrow; spikelets arranged in dense terminal spikes, 1-flowered, in clusters of 3 at each node of a jointed rachis, the middle spikelet sessile and perfect, the lateral ones reduced awn-like glumes; glumes and lemmas awned.

Plants annual.

Culms erect; glumes not ciliate..... *H. vulgare.*

Culms spreading; some of the glumes ciliate..... *H. murinum.*

Plants perennial.

Awns of the fertile florets much less than 1 cm. long... *H. muticum.*

Awns of the fertile florets about 1 cm. long..... *H. halophilum.*

Hordeum halophilum Griseb. Abh. Ges. Wiss. Goett. 19: 249. 1874.

Plants forming dense clumps, 40 cm. high or less; blades finely pubescent, 2 mm. wide; spikes steel-blue, 3–5 cm. long, nearly 1 cm. thick.

Lima: Río Blanco, steep western slope, 3,600 meters, *751*. Ranging to Argentina.

Hordeum murinum L. Sp. Pl. 85. 1753.

Culms spreading, 10–20 cm. high; blades more or less pilose, 2–4 mm. wide; spikes green or purplish, 2–4 cm. long, the conspicuous awns 2–3 cm. long.

Lima: Matucana, in swales, 2,400 meters, *221*. A native of Europe, sometimes naturalized in America.

Hordeum muticum Presl, Rel. Haenk. 1: 327. 1839. *H. andicola* Griseb. Abh. Ges. Wiss. Goett. 24: 285. 1879.

Plants erect or procumbent, forming small clumps, the culms 20–40 cm. high or more; blades 2 mm. wide; spikes slender, dark purplish, 2–5 cm. long, scarcely more than 5 mm. thick; awns usually not exceeding the acuminate fertile floret.

Junín: Cerro de Pasco, 4,200 meters, open ground and along ditches, *Hitchcock 22224*.—Puno: Chuquibambilla, 3,900 meters,

Pennell 13421.—Huánuco: Huánuco, *Haenke*, type. Ranging to Argentina and Chile.

Hordeum vulgare L. Sp. Pl. 84. 1753.

An erect annual, often 1 meter high or more; blades flat; spikes large, with very long, erect, stiff awns.

Cuzco: Cuzco, *Hitchcock 22457.* Aguas Calientes, *Cook & Gilbert 189.*—Huánuco: Mito, abandoned field, *3429a.* A native of the Old World, cultivated in temperate regions of America. "Cebada."

In the tropics barley is planted only at middle and high elevations. In Peru it is grown as feed for stock, and for its grain, employed in making beer. A meal (jakku) made from the parched grain is used in Peru as food.

27. LOLIUM L. Rye Grass

Slender annuals or perennials; spikelets several-flowered, solitary, sessile, placed edgewise to the continuous rachis, one edge fitting in the alternate concavities; rachilla disjointing above the glumes and between the florets; first glume wanting except on the terminal spikelet, the second strongly 3–5-nerved; lemmas rounded on the back, 5–7-nerved, obtuse, acute, or awned.

Lolium temulentum L. Sp. Pl. 83. 1753.

A slender erect annual 1 meter high or less; blades flat, narrow, elongate; spikelets arranged in stiff spikes 25 cm. long or less; lemmas awned.

Lima: Lima, *Hitchcock 22426.* Native of the Old World, sometimes naturalized in America. "Darnel." "Cerisuelo."

Lolium temulentum L. var. **arvense** (With.) Bab. Man. Brit. Bot. 377. 1843. *L. arvense* With. Bot. Arr. Veg. Brit. ed. 3. 2: 168. 1796.

Differing from the typical form in having awnless lemmas.

Cuzco: Cuzco, *Hitchcock 22472.* A native of Europe, occasionally naturalized in America.

28. PARIANA Aubl.

Coarse perennials, sometimes with distinct fertile and sterile culms, the blades broad and flat; spikelets in opposite clusters of 3 at each joint of an easily disarticulating rachis, forming an elongate spike; center spikelet of the cluster pistillate, the other 2 staminate; stamens numerous.

Sheaths with numerous bristles at the summit, these more than 1 cm. long.....*P. campestris.*

Sheaths naked, or with only a few, usually short and inconspicuous bristles.....*P. zingiberina.*

Pariana campestris Aubl. Pl. Guian. 2: 876. *pl. 337.* 1775. *P. lunata* Nees, Agrost. Bras. 295. 1829.

Plants tall and stout, usually 1 meter high or more, the culms densely leafy; blades narrowly lance-oblong, 15–20 cm. long and 4–5 cm. wide or sometimes larger, often pale beneath, long-acuminate; spikes green, 10 cm. long or more.

Huánuco: Yanano, in sunny thickets, 1,800 meters, *3779.*—Loreto: La Victoria, in forest, *Williams 2980.* Pisco, Río Nanay, in forest, *Williams 775.* Pinto-cocha, Río Nanay, in forest, *Williams 787.* Between Río Nanay and Río Napo, *Williams 719.* Yurimaguas, Río Huallaga, *Williams 3831.* Mishuyacu, *Klug 956, 209.* Bolivia to Brazil and the Guianas. "Sillaca," "palmera de altura."

Reported to be employed medicinally for the treatment of women during pregnancy.

Pariana zingiberina Doell in Mart. Fl. Bras. 2, pt. 2: 337. 1877. ?*P. maynensis* Huber, Bol. Mus. Goeldi 4: 526. 1906.

Culms erect, 1 meter high or more, usually dimorphous, the sterile culms leafy, the blades of the fertile culms reduced to sheaths; blades oblong or lance-oblong, 12–15 cm. long and 3–5 cm. wide, green beneath; spikes 5–8 cm. long, somewhat resembling a spike of beardless wheat.

Junín: La Merced, 600 meters, sandy valley floor, *5475.*—Loreto: Yurimaguas, in or at the edge of forest, *Williams 4098, 4733.* Puerto Arturo, Yurimaguas, in forest, *Williams 5066.* Caballo-cocha, in forest, *Williams 2223.* Iquitos, *Williams 8063.* La Victoria, *Williams 3000.*—San Martín: Cerro de Canchahuayo, Río Ucayali, *Huber 1440,* type of *P. maynensis.* Bolivia to Brazil and the Guianas. "Aniushi-pincuío."

29. DISSANTHELIUM Trin.

Plants annual or perennial, dwarf, with narrow elongate blades and small, oblong to oval panicles; spikelets small, usually 2-flowered; glumes equal, longer than the obtuse or acutish, awnless, 3-nerved lemmas.

Plants annual; panicles oblong, more or less spike-like. *D. minimum.*

Plants perennial; panicles oval.

Glumes 3 mm. long.....*D. calycinum.*

Glumes 5–6 mm. long.....*D. peruvianum.*

Dissanthelium calycinum (Presl) Hitchc. Journ. Wash. Acad. Sci. 13: 224. 1923. *Brizopyrum calycinum* Presl, Rel. Haenk. 1: 281. 1830. *D. supinum* Trin. Linnaea 10: 305. 1836. *Deschampsia Mathewsii* Ball, Journ. Linn. Soc. Bot. 22: 60. 1885.

Plants densely cespitose, the culms less than 10 cm. high; sheaths broad and pale, densely imbricate, the short blades folded or involute; panicles dense or finally open, 1–3 cm. long, green or purplish.

Cuzco: Panticaya Pass, *Cook & Gilbert 1297.*—Huánuco: 15 miles northeast of Huánuco, 3,660 meters, common in wet places, *2183.*—Junín: Yauli, 4,050 meters, loose slope, *933.* Huarón, rocky slopes, 4,200 meters, *1153.* Hacienda Atocsaico, 4,000 meters, *Hitchcock 22204.* Cerro de Pasco, *Poeppig,* type of *D. supinum.*—Lima: Casapalca, *Mathews,* type of *Deschampsia Mathewsii.*—Puno: Macusani, *Lechler 1832.* Also in Bolivia.

Dissanthelium minimum Pilger, Bot. Jahrb. 56: Beibl. 123: 28. 1920. *Vilfa macusaniensis* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *Graminastrum macusaniense* Krause, Beih. Bot. Centralbl. 32: 348. 1914.

Plants erect or spreading, 2–10 cm. high, often forming tufts; blades narrow and elongate; panicles 1–2 cm. long, dense; glumes acute, the lemmas acute or mucronate.

Arequipa: Nevado de Chachani, 3,700 meters, gravelly slope, *Pennell 13280.*—Ayacucho: Between Pisco and Ayacucho, *Weberbauer 5451,* type.—Cuzco: La Raya, 4,300 meters, in cushions of *Distichia* on wet moor, *Pennell 13492a.*—Lima: Viso, 2,700 meters, *628.* Near Antaicocha, open gravelly slopes, 4,000 meters, *Pennell 14691, 14654.*—Puno: Macusani, *Lechler 1836,* type of *Vilfa macusaniensis.* Also in Bolivia.

Dissanthelium peruvianum (Nees & Mey.) Pilger, Bot. Jahrb. 37: 378. 1906. *Phalaridium peruvianum* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 29. 1841.

Plants densely tufted, 15 cm. high or less; sheaths shining, loose, pale, imbricate, conspicuous, the blades narrow and mostly erect; panicles pale green, 3–4 cm. long.

Junín: Huarón, 4,200 meters, rock ledges, *1155.*—Puno: Lake Titicaca, *Meyen,* type. Also in Bolivia.

30. KOELERIA Pers.

Plants annual or perennial, slender, erect; blades elongate and narrow, flat; panicles densely flowered, narrow and more or less spike-like; spikelets 2–4-flowered, the glumes unequal, somewhat shorter than the florets, lemmas awned.

Plants perennial..... *K. cristata.*
Plants annual..... *K. trachyantha.*

Koeleria cristata (L.) Pers. Syn. Pl. 1: 97. 1805. *Aira cristata* L. Sp. Pl. 63. 1753.

Plants cespitose, commonly 30–50 cm. high; blades mostly basal, green; panicles spike-like, 5–10 cm. long, often interrupted toward the base, pale green.

Junín: Chinche, 3,450 meters, on slopes, *1280a.* La Oroya, *Hitchcock 22184.* Temperate regions of both hemispheres.

Koeleria trachyantha Philippi, Fl. Atacam. 55. 1860.

Plants slender or stout, 40 cm. high or less; sheaths loose and conspicuous, the blades 5 mm. wide or less, bright green; panicles pale green, 2–5 cm. long, often interrupted.

Arequipa: Mollendo, the dominant grass on the interior desert hills, *Hitchcock 22423.*—Ica: Sangayán Island, *Murphy 3477.*—Lima: Chorrillos, loose stony slopes of seaside hills, *5871.* Near Chorrillos, 250 meters, *Weberbauer 5708.* Also in Chile.

31. TRISETUM Pers.

Tufted perennials with flat elongate blades, the panicles open or usually contracted and spike-like; spikelets commonly 2-flowered, sometimes 3–5-flowered, the rachilla prolonged behind the upper floret, commonly villous; glumes somewhat unequal, acute; lemmas usually short-bearded at the base, 2-toothed at the apex, the teeth often awned, bearing from the back below the cleft apex a straight or bent awn.

Glumes with long slender attenuate tips, 1 cm. long. *T. floribundum.*
Glumes acute or acuminate, not attenuate, less than 1 cm. long.
  Glumes about equal in size and shape, 8 mm. long. *T. Macbridei.*
  Glumes unequal, 4–5 mm. long, the first shorter and narrower than the second..... *T. spicatum.*

Trisetum floribundum Pilger, Bot. Jahrb. 37: 505. 1906. *T. Weberbaueri* Pilger, op. cit. 506. 1906.

Plants densely tufted, 10–40 cm. high; blades short or elongate, involute, very slender, often flexuous; panicles dense, ovoid, 2–7 cm. long, green or purple.

Ancash: Above Ocros, 4,700 meters, *Weberbauer 2811*. Cordillera Negra above Caraz, 4,200 meters, *Weberbauer 3078*, type of *T. Weberbaueri*.—Arequipa: Nevado de Chachani, 4,500 meters, rock ledges, *Pennell 13313*.—Cuzco: Cordilleras del Pachatusán, 4,400 meters, *Herrera 2577*.—Huancavelica: Cordillera between Pisco and Ayacucho, 4,900 meters, *Weberbauer 5441*.—Junín: Casapalca, 4,650 meters, *851*. Huarón, 4,200 meters, rocky slopes, *1130*.—Puno: Araranca, *Weberbauer 1028*, type. Also in Bolivia.

Trisetum Macbridei Hitchc. Contr. U. S. Nat. Herb. 24: 359. 1927.

A densely tufted, erect perennial, 20–40 cm. high; blades flat and rather short, puberulent; panicles dense and spike-like, 7–8 cm. long, green or dark purple; spikelets 2-flowered, 8 mm. long.

Junín: Huarón, rocky slope, 4,200 meters, *1131*.

Trisetum spicatum (L.) Richt. Pl. Eur. 1: 59. 1890. *Aira spicata* L. Sp. Pl. 64. 1753.

Erect, 10–30 cm. high, forming dense clumps; blades flat, chiefly basal; panicles dense or often interrupted, narrow and spike-like.

Cuzco: Cuzco, *Hitchcock 22471*.—Ica: Sangayán Island, *Murphy 3481*.—Junín: Baños, *Wilkes Exped.* Cerro de Pasco, *Hitchcock 22254*. Colder regions of both hemispheres.

32. AVENA L. Oats

Annuals or perennials, usually erect or nearly so, with long narrow flat blades; panicles open or dense; spikelets large, 2–4-flowered; glumes equal, many-nerved, papery, longer than the florets; lemmas bidentate, bearing a long dorsal awn, or the awn sometimes rudimentary.

Teeth of the lemma awned.....*A. barbata.*
Teeth of the lemma not awned.....*A. sterilis.*

Avena barbata Brot. Fl. Lusit. 1: 108. 1804.

A tall stout annual, the blades flat, bright green, mostly 4–5 mm. wide; panicles large and open, the large spikelets on very long and filiform, flexuous pedicels.

Lima: Matucana, rocky slope, 2,400 meters, *136*. A native of Europe; sometimes naturalized in America.

Avena sterilis L. Sp. Pl. ed. 2. 118. 1762.

Plants annual, tall and stout, with elongate flat blades; panicles large and open; glumes 3 cm. long; awn about 2 cm. long below the bend and 4 cm. long above it.

Cuzco: Cuzco, *Hitchcock 22454*.—Huánuco: Mito, a bad weed of grain fields, 2,700 meters, *3428*. A native of Europe, naturalized in some parts of America.

33. DANTHONIA Lam. & DC.

Perennials with flat or involute blades; spikelets several-flowered; glumes subequal, exceeding all the florets; lemmas bifid, with a twisted awn between the teeth; awn flat, formed by the prolongation of the 3 middle nerves of the lemma.

Danthonia secundiflora Presl, Rel. Haenk. 1: 255. 1830.

An erect perennial 30–60 cm. high, forming clumps; blades loosely involute; panicles narrow, rather few-flowered, purple, 5–8 cm. long; teeth of the lemma terminating in long slender awns.

Originally described from Peru, the type collected by Haenke. Ranging to Brazil and Ecuador.

34. LAMPROTHYRSUS Pilger

Tall and coarse perennials with large and plume-like panicles; spikelets several-flowered, pilose, the florets disjointing at the base of the rachilla joint, the rachilla long-villous; lemmas 2-toothed; awn inserted between the teeth of the lemma, slender, slightly twisted, widely spreading; teeth of the lemma prolonged into delicate awns.

Lamprothyrsus peruvianus Hitchc. Proc. Biol. Soc. Wash. 36: 195. 1923.

Plants 1–2 meters high, stout; blades elongate, pale, flat or involute; panicles dense, purplish, 10–40 cm. long or more; old sheaths at the base of the plant becoming flattened and curled.

Cuzco: Torontoi, *Cook & Gilbert 1189*.—Junín: Yanahuanca, *1205*, type. Also in Ecuador.

35. CALAMAGROSTIS Adans.

Perennials with usually elongate and very narrow blades; spikelets small, arranged in open or usually narrow and often spike-like panicles; spikelets 1-flowered, disjointing above the glumes, usually prolonged behind the palea as a short and commonly hairy

bristle; glumes subequal, acute or acuminate; lemma shorter and generally more delicate than the glumes, the callus bearing a tuft of hairs that often are copious and as long as the lemma, awned from the back and usually below the middle, the awn delicate and straight or stouter and exserted, bent and often twisted.

Panicles open, the spreading capillary branches, at least the lower ones, naked for 2–5 cm. at the base (sometimes less or ascending in *C. eminens*). Plants 70 cm. high or more.

Spikelets clustered at the ends of the branchlets; panicles golden bronze.....*C. eminens.*

Spikelets not in crowded clusters; panicles not golden bronze. *C. amoena.*

Panicles narrow, the ascending branches spikelet-bearing from near the base.

Blades flat and lax, 3–8 mm. wide. Hairs of the callus or rachilla about as long as the floret.

Callus hairs short and scant. Rachilla hairs copious. *C. planifolia.*

Callus with copious long hairs.

Rachilla pubescent, inconspicuous; awn inserted about 0.5 mm. below the apex of the lemma; lemma shorter than the glumes.....*C. montevidensis.*

Rachilla with long hairs at the apex; awn inserted about the middle of the lemma; lemma about equaling the glumes. *C. Beyrichiana.*

Blades involute or folded or, if flat, not more than 2 mm. wide (culm blades rarely wider in *C. heterophylla*, but the basal blades involute).

Blades of the basal innovations involute-filiform, those of the culm flat or loosely involute, all soft and lax. Lemma aristate-toothed; hairs inconspicuous.....*C. heterophylla.*

Blades all alike.

Sheaths with erect auricles 1 cm. long or more, hyaline at the summit; floret raised on a stipe, this usually disjointing at the summit and remaining in the glumes. *C. podophora.*

Sheaths not long-auricled; floret sessile.

Rachilla glabrous, very short. Callus hairs less than 0.5 mm. long; dwarf cespitose plants.

Culms usually less than 10 cm. high; panicles 1–2 cm. long; blades commonly less than 3 cm. long; awn attached about one-fourth the distance above the base of the lemma..... *C. Preslii.*

Culms 10–30 cm. high; panicles 3–8 cm. long; blades usually 5–10 cm. long; awn attached above the middle of the lemma..... *C. rigescens.*

Rachilla more or less hairy, often long-villous (obscurely so in *C. vicunarum* and its allies).

Callus hairs prominent, when as short as 1 mm. the rachilla hairs scant.

Panicles about 15 cm. long, rather loose. Awn bent, shorter than the lemma; callus hairs about 2 mm. long; rachilla 1 mm. long, the rather scant hairs extending to 2 mm.; glumes 5 mm. long. *C. Haenkeana.*

Panicles short and dense.

Panicle oblong, 5–10 cm. long; plants scaberulous; rachilla naked below the summit. *C. chrysantha.*

Panicle oval or ovate, 2–4 cm. long; blades of the culm slightly scaberulous; rachilla villous below the summit, the hairs shorter than those of the summit..... *C. ovata.*

Callus hairs scant or obsolete, if as much as 1 mm. long the rachilla hairs prominent.

Rachilla short, its hairs scant, usually not more than 1 mm. long..... *C. vicunarum.*

Rachilla and its usually copious hairs reaching to 2 mm. or more.

Lemma scaberulous.

Awn attached less than 1 mm. above the base of the lemma. Glumes 4 mm. long; blades elongate-filiform..... *C. trichophylla.*

Awn attached more than 1 mm. from the base of the lemma.

Hairs on the rachilla rather scant, the rachilla and hairs less than 3 mm. long. Panicle narrow, rather compact; palea about equaling the lemma..... *C. recta.*

Hairs on the rachilla copious, the rachilla and hairs usually 2–3 mm. long.

Panicle 2–4 cm. long, dense, ovoid. *C. spicigera.*

Panicle usually more than 10 cm. long.

Panicle narrow, pale, rather compact, 10–20 cm. long..... *C. rigida.*

Panicle somewhat open, purplish.

Blades glabrous..... *C. macrophylla.*

Blades scabrous.

Spikelets 5–6 mm. long; plants often more than 1 meter high; panicles mostly 20–30 cm. long. *C. Humboldtiana.*

Spikelets 7 mm. long; plants about 30 cm. high; panicles mostly less than 10 cm. long.... *C. glacialis.*

Lemma glabrous.

Panicles dense and spike-like, sometimes interrupted at the base.

Panicles 1–2 cm. long..... *C. cephalantha.*

Panicles more than 3 cm. long, usually more than 5 cm.

Rachilla hairs, lemma, and glumes all about 5 mm. long..... *C. densiflora.*

Rachilla hairs and lemma shorter than the glumes.

Summit of the lemma toothed; rachilla hairs about as long as the lemma. *C. brevifolia.*

Summit of the lemma not toothed; rachilla hairs shorter than the lemma. *C. fuscata.*

Panicles narrow but somewhat open.

Panicles mostly less than 5 cm. long, rather loosely few-flowered..... *C. violacea.*

Panicles mostly more than 5 cm. long.

Rachilla hairs copious, about as long as the lemma..... *C. antoniana.*

Calamagrostis amoena Pilger, Bot. Jahrb. 42: 60. 1908. *Deyeuxia amoena* Pilger, Bot. Jahrb. 27: 28. 1899.

Plants erect, cespitose, the slender culms 20–60 cm. high; blades slender, erect, flexuous, involute, scabrous, shorter than the culms; panicles rather loose, purplish, mostly 4–8 cm. long; glumes 4.5–5 mm. long.

Apurímac: Abancai, *Stordy* in 1920. Also in Bolivia.

Calamagrostis antoniana (Griseb.) Steud. ex Hitchc. Contr. U. S. Nat. Herb. 24: 378. 1827. *C. antoniana* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *Agrostis antoniana* Griseb. Abh. Ges. Wiss. Goett. 24: 293. 1879. *C. sandiensis* Pilger, Bot. Jahrb. 42: 68. 1908.

Plants erect, forming loose or dense clumps, 30–60 cm. high, pale or bright green; blades long, stiff, involute, sharp-pointed, scabrous; panicles narrow but often rather loose, 10–15 cm. long, often dark-colored.

Huánuco: Mito, 2,700 meters, on slopes, *1672*.—Junín: Mount La Juntai, 4,700 meters, *Killip & Smith 22072*.—Lima: Casapalca, *Ball* in 1882.—Puno: San Antonio, *Lechler 1800*, type. Cuyocuyo, *Weberbauer 906*, type of *C. sandiensis*. Also in Bolivia.

Calamagrostis Beyrichiana Nees ex Doell in Mart. Fl. Bras. 2, pt. 3: 53. *pl. 16*. 1878.

A tall perennial about 1 meter high; blades flat and elongate; panicles narrow, loose and nodding, 20–30 cm. long; lemma about as long as the glumes, obscurely nerved, awn inserted about the middle; rachilla with long hairs at the apex.

Junín: Between Tarma and La Merced, *Hitchcock 22152*. Ecuador to Bolivia and Brazil.

Calamagrostis brevifolia (Presl) Steud. Nom. Bot. ed. 2. 1: 249. 1840. *Deyeuxia brevifolia* Presl, Rel. Haenk. 1: 248. 1830.

Plants cespitose, with dense cushions of curly foliage at the base; blades slender, involute, much shorter than the culms; panicles dense and spike-like, bronze or purple, 3–8 cm. long.

Huánuco: Type from Huánuco, *Haenke*.—Junín: Empalme, 4,000 meters, dry soil, *Killip & Smith 21771*. Cerro de Pasco, 4,200 meters, seepage place on slope, *Hitchcock 22253*.—Lima: Río Blanco, 4,500 meters, common on moist upland slopes, *785*. Also in Bolivia.

Calamagrostis cephalantha Pilger, Bot. Jahrb. 42: 61. 1908.

A dwarf cespitose perennial, the slender culms 15 cm. high or less, sometimes much reduced; blades short, folded, pubescent; panicles ovoid, dense, 1–2 cm. long; glumes 6 mm. long.

Junín: Between Casacancha and Culnai, *Wilkes Exped.*—Puno: Type collected between Poto, Peru, and Suches, Bolivia, *Weberbauer 1003.* Known only from Peru and Bolivia.

Calamagrostis chrysantha (Presl) Steud. Nom. Bot. ed. 2. 1: 250. 1840. *Deyeuxia chrysantha* Presl, Rel. Haenk. 1: 247. 1830. *C. mutica* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *Stylagrostis chrysantha* Mez, Bot. Archiv Mez 1: 20. 1922.

A densely cespitose, glabrous perennial, forming broad clumps, the stout erect culms 15–50 cm. high; blades stiff, erect, sharp-pointed, involute; panicles spike-like and very dense, golden bronze, 2.5–5 cm. long.

Huánuco: Type from Huánuco, *Haenke.*—Junín: Casapalca, 4,800 meters, marshy edge of alpine lake, *864.*—Arequipa: Vinocaya, 4,380 meters, open dry knolls, *Pennell 13343.*—Puno: Ayapata, *Lechler 1965,* type of *C. mutica.* Bolivia and Chile.

One of the collections cited was determined originally as *C. Jamesonii* Munro.

Calamagrostis densiflora (Presl) Steud. Nom. Bot. ed. 2. 1: 250. 1840. *Deyeuxia densiflora* Presl, Rel. Haenk. 1: 247. 1830.

Similar to *C. Humboldtiana;* panicles usually shorter and denser; rachilla shorter, long-villous, the hairs copious and as long as the lemma.

Huánuco: Type from Huánuco, *Haenke.*—Junín: Hacienda Atocsaico, *Hitchcock 22223.* Oroya, *Hitchcock 22136.*

Calamagrostis eminens (Presl) Steud. Nom. Bot. ed. 2. 1: 250. 1840. *Deyeuxia eminens* Presl, Rel. Haenk. 1: 250. 1830. *Stylagrostis eminens* Mez, Bot. Archiv Mez 1: 20. 1922.

A stout coarse perennial about 1 meter high, often forming dense clumps; blades stiff, elongate, more or less involute, scabrous; panicles open or rather dense, nodding, bronze-yellow, 15–30 cm. long, the spikelets in dense glomerules at the ends of the branches; glumes 4 mm. long.

Ancash: Pomopampa, 4,200 meters, springy places, *2500.*—Huánuco: Type from Huánuco, *Haenke.*—Junín: Huarón, 4,200

meters, sandy lake shore, *1134*. Gollarisquisga, 4,000 meters, wet stream bank, *Hitchcock 22332*. Hacienda Atocsaico, 4,000 meters, springy place on hillside, *Hitchcock 22221*. Also in Bolivia.

Calamagrostis fuscata (Presl) Steud. Nom. Bot. ed. 2. 1: 250. 1840. *Deyeuxia fuscata* Presl, Rel. Haenk. 1: 249. 1830.

A cespitose perennial 20–40 cm. high; blades numerous, slender, involute, smooth, equaling the culms; panicles narrow but hardly spike-like, 10 cm. long or less.

Huánuco: Type from Huánuco, *Haenke*. Mito, 2,700 meters, on upland slopes, *3322*, *3364*.—Junín: La Oroya, 3,600 meters, on slopes, *948*.—Puno: Tabina, *Lechler 2142*.

Calamagrostis glacialis (Wedd.) Hitchc. Contr. U. S. Nat. Herb. 24: 375. 1927. *Deyeuxia glacialis* Wedd. Bull. Soc. Bot. France 22: 179. 1875.

Perennial, erect, forming large dense clumps, pale, the scabrous culms stout, 30–40 cm. high; blades erect, stiff, scabrous, sharp-pointed, almost equaling the culms; panicles more or less spike-like, dense, tawny-purple, 5–15 cm. long; glumes 7 mm. long; awn about equaling the glumes; rachilla hairs long and copious.

Junín: Mount La Juntai, near Huancayo, 4,700 meters, *Killip & Smith 22098*. Also in Bolivia.

Calamagrostis Haenkeana Hitchc. Contr. U. S. Nat. Herb. 24: 371. 1927. *Agrostis arundinacea* Presl, Rel. Haenk. 1: 238. 1830, non *C. arundinacea* Roth, 1788.

Culms erect, 70 cm. high; blades involute; panicle oblong-lanceolate, rather loose, pale, 15 cm. long; spikelets 5 mm. long; lemma slightly shorter than the glumes, minutely scaberulous; awn attached below the middle, bent, exserted at the side of the glumes, shorter than the lemma.

Huánuco: Mountains of Huánuco, *Haenke*.

Calamagrostis heterophylla (Wedd.) Pilger, Bot. Jahrb. 42: 64. 1908. *Muhlenbergia rupestris* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *Deyeuxia heterophylla* Wedd. Bull. Soc. Bot. France 22: 177. 1875. *Chaetotropis andina* Ball, Journ. Linn. Soc. Bot. 22: 58. 1885. *Calamagrostis heterophylla* var. *pubescens* Pilger, Bot. Jahrb. 42: 64. 1908. *C. heterophylla* var. *robustior* Pilger, loc. cit. *Calamagrostis calvescens* Pilger, op. cit. 65. 1908.

A lax or densely cespitose perennial 20–100 cm. high; blades flat and soft, the basal ones almost filiform; panicles narrow, dense, interrupted, green or tawny, 5–15 cm. long; glumes 3–4 mm. long or sometimes as much as 6 mm.; palea with slender teeth at the summit; rachilla scarcely 1 mm. long, short-pilose; callus hairs very short or sometimes as much as 1 mm. long.

Ancash: Caraz, *Weberbauer 3105*. Between Samanco and Caraz, *Weberbauer 2842*, type of *C. calvescens*.—Arequipa: Near Sumbai, 4,000 meters, *Weberbauer 6901*.—Cuzco: Cordillera between Pisac and Paucartambo, 4,100 meters, *Weberbauer 6915*.—Huánuco: Mito, 2,700 meters, *1672a*.—Junín: Huarón, 4,200 meters, rocky slopes, *998*. Chinche, 3,450 meters, *1280*. La Oroya, 3,000 meters, base of hills, *Hitchcock 22187*.—Lima: Chicla, *Ball*, type of *Chaetotropis andina*. Matucana, 2,400 meters, hilltops and mountain sides, *359, 439*. Río Blanco, 3,600 meters, grassy slopes, *652, 802*.—Puno: Araranca, 4,200 meters, grassy slopes, *Pennell 13474*. Azángaro, *Weberbauer 474*, type of *C. heterophylla* var. *robustior; Lechler 1756*. Cuyocuyo, *Weberbauer 905*, type of *C. heterophylla* var. *pubescens*. San Antonio, *Lechler 1809*, type of *Muhlenbergia rupestris*. Ecuador to Bolivia.

Calamagrostis Humboldtiana Steud. Nom. Bot. ed. 2. 1: 250. 1840. *Deyeuxia stricta* HBK. Nov. Gen. & Sp. 1: 146. 1816, non *C. stricta* Koel. 1802. *D. intermedia* Presl, Rel. Haenk. 1: 249. 1830. *C. intermedia* Steud. Nom. Bot. ed. 2. 1: 250. 1840. *C. agapatea* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants erect, rather pale, forming dense clumps, the glabrous culms 30–100 cm. high; blades erect, involute, scabrous; panicles rather loose, 15–35 cm. long, often dark-colored; glumes 6 mm. long; lemma 5 mm. long, scaberulous, toothed, the callus hairs short; awn bent and exserted; rachilla 2.5–3 mm. long, pilose with rather short hairs.

Huánuco: Type of *D. intermedia* from Huánuco, *Haenke*. Six miles south of Mito, 3,150 meters, grassy summits, *1875*. Mito, 2,700 meters, edge of thicket, *1697*.—Junín: Yauli, 4,050 meters, *903*. La Oroya, 3,600 meters, *951*. Tarma, 3,600 meters, limestone slopes, *1067*. San José, 3,900 meters, granitic slope, *1105*.—Puno: Ayapata, *Lechler 1843*, type of *C. agapatea*. Araranca, 4,200 meters, siliceous slope, *Pennell 13460*. Argentina to Colombia.

Calamagrostis macrophylla Pilger, Bot. Jahrb. 42: 60. 1908. *Deyeuxia macrophylla* Pilger, Bot. Jahrb. 25: 711. 1898.

A coarse perennial, forming dense clumps, the culms 1 meter high or less; blades long, erect, involute, glabrous; panicles rather loose, greenish, large and elongate; spikelets 8–9 mm. long.

Junín: Chinche, open slope, 3,450 meters, *1284*. Also in Ecuador.

Calamagrostis montevidensis Nees, Agrost. Bras. 401. 1829. *Deyeuxia alba* Presl, Rel. Haenk. 1: 248. 1830.

Plants lax, 1 meter high or less; blades flat, green, elongate; panicles narrow, loose, nodding, 20–30 cm. long or often shorter; glumes 4 mm. long, acuminate; lemma shorter than the glumes, rather prominently nerved, the awn inserted 0.5 mm. below the apex; rachilla pubescent, inconspicuous.

Huánuco: Vilcabamba, 1,800 meters, clay banks, *5152*. Bolivia to Brazil and Argentina. Type of *Deyeuxia alba* from Peru, *Haenke*.

Calamagrostis ovata (Presl) Steud. Nom. Bot. ed. 2. 1: 251. 1840. *Deyeuxia ovata* Presl, Rel. Haenk. 1: 246. 1830. *Stylagrostis ovata* Mez, Bot. Archiv Mez 1: 20. 1922.

An erect perennial 10–20 cm. high, forming dense clumps; sheaths loose, glabrous, often inflated, the blades flat or loosely involute; panicles ovoid or oblong, very dense, golden brown, 2–5 cm. long; glumes soft, attenuate, 10–12 mm. long.

Huánuco: Type from Huánuco, *Haenke*.—Junín: Mount La Juntai, near Huancayo, 4,700 meters, *Killip & Smith 22079*.—Puno: Ayapata, *Lechler 1827*. Tabina, *Lechler 2057*. Also in Bolivia.

Calamagrostis podophora Pilger, Bot. Jahrb. 42: 66. 1908.

An erect perennial 40–60 cm. high, forming dense clumps; blades firm, involute, glabrous, the basal 10–15 cm. long, the cauline 3–5 cm. long; ligules membranaceous, 10–15 mm. long; panicles oblong, open, 10–15 cm. long; glumes 5 mm. long, the lemma 3 mm. long; callus hairs and rachilla hairs elongate.

Junín: Mountains near Huacapistana, 3,500 meters, *Weberbauer 2231*, type. Hacienda Runatuyo, 4,500 meters, *Weberbauer 6622*. Ecuador and Colombia.

Calamagrostis Preslii (Kunth) Hitchc. Contr. U. S. Nat. Herb. 24: 370. 1927. *Agrostis caespitosa* Presl, Rel. Haenk. 1: 237. 1830, non Salisb. 1796. *A. Preslii* Kunth, Rév. Gram. 1: Suppl. 17. 1830. *Bromidium caespitosum* Nees, Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 23. 1841. *Bromidium hygrometricum* var. *caespitosum*

Kuntze, Rev. 3, pt. 2: 343. 1898. *C. caespitosa* Scribn. Rept. Mo. Bot. Gard. 10: 37. 1899, non Steud. 1854.

A densely cespitose perennial, forming tussocks, usually less than 10 cm. high; blades short, firm, folded; panicles spike-like, about 2 cm. long.

Junín: Cerro de Pasco, *Hitchcock 22236*. Hacienda Atocsaico, *Hitchcock 22198*. Type collected in Peru by Haenke.

Calamagrostis recta (HBK.) Trin. ex Steud. Nom. Bot. ed. 2. 1: 251. 1840. *Deyeuxia recta* HBK. Nov. Gen. & Sp. 1: 144. 1816. *D. pallens* Presl, Rel. Haenk. 1: 249. 1830. *C. pallens* Steud. Nom. Bot. ed. 2. 1: 251. 1840.

A rather robust perennial, erect, densely cespitose, 1 meter high or less; blades firm, involute, scabrous, half as long as the culms; panicles narrow and dense, almost spike-like, usually 10–20 cm. long.

Huánuco: Huánuco, *Haenke*, type of *D. pallens*.—Junín: Gollarisquisga, *Hitchcock 22283*.—Puno: Sachapata, *Lechler 2695, 3304*. Also in Ecuador.

Calamagrostis rigescens (Presl) Scribn. Rept. Mo. Bot. Gard. 10: 37. 1899. *Agrostis rigescens* Presl, Rel. Haenk. 1: 237. 1830. *Bromidium spectabile* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 24. 1841. *B. rigescens* Nees, op. cit. 22. 1841. *?B. rigescens* var. *brevifolium* Nees, op. cit. 22. 1841. *Chamaecalamus spectabilis* Meyen, op. cit. 24. 1841, in syn. *Calamagrostis cajatambensis* Pilger, Bot, Jahrb. 42: 64. 1908.

A dwarf perennial, usually pale, commonly 10–20 cm. high, forming dense clumps; blades stiff, involute, erect; panicles spike-like, more or less interrupted, 3–8 cm. long, dark purplish; glumes 4 mm. long; awn exserted about 2 mm.; rachilla naked.

Ancash: Cajatamba, *Weberbauer 2686*, type of *C. cajatambensis*.—Arequipa: Vinocaya, 4,380 meters, wet soil along stream, *Pennell 13341, 13340*.—Junín: Cerro de Pasco, *Hitchcock 22238*.—Lima: Río Blanco, 4,500 meters, moist upland slopes, *786*.—Puno: Ayapata, *Lechler 1981*. Lake Titicaca, *Meyen*, type of *Bromidium spectabile*. Ecuador to northern Argentina. Type collected in Peru by Haenke.

Calamagrostis rigida (HBK.) Trin. ex Steud. Nom. Bot. ed. 2. 1: 251. 1840. *Deyeuxia rigida* HBK. Nov. Gen. & Sp. 1: 144. 1816. *C. nitidula* Pilger, Bot. Jahrb. 42: 69. 1908. *C. nitidula* var. *elata* Pilger, op. cit. 70. 1908. *C. nitidula* var. *macrantha* Pilger, op. cit. 70. 1908.

A densely cespitose perennial about 50 cm. high; blades stiff, involute, scabrous, 1 mm. thick; panicles narrow and dense, almost spike-like, 10–15 cm. long; glumes 8 mm. long.

Puno: Between Poto and Ananea, 4,400 meters, stony soil, *Weberbauer 960*, type of *C. nitidula*. Above Ananea, 5,100 meters, on cliffs, *Weberbauer 1041*, type of *D. nitidula* var. *macrantha*. Also in Ecuador and Bolivia.

Calamagrostis spicigera (Presl) Steud. Nom. Bot. ed. 2. 1: 251. 1840. *Deyeuxia spicigera* Presl, Rel. Haenk. 1: 247. 1830.

An erect glabrous perennial 15 cm. high; blades slender, involute; panicles spike-like, 3 cm. long; glumes 6 mm. long; lemma 5 mm. long, toothed, scaberulous, the callus hairs hardly 1 mm. long; awn almost straight, attached just below the middle of the lemma, equaling the glumes; rachilla 2 mm. long, densely long-pilose.

Huánuco: Type collected in the mountains of Huánuco, *Haenke*.

Calamagrostis tarmensis Pilger, Bot. Jahrb. 42: 70. 1908.

Plants slender, erect, 40–80 cm. high, forming dense clumps; blades very slender, elongate, flat or loosely involute; panicles narrow but rather loose, 10–15 cm. long, purplish.

Cuzco: Paso de Tres Cruces, 3,800 m., open grassy paramo, *Pennell 13844*.—Junín: Mountains east of Palca, 2,700–3,100 m., *Weberbauer 2460*, type. Ecuador to Bolivia.

Calamagrostis trichophylla Pilger, Bot. Jahrb. 42: 67. 1908.

Plants erect, 30–50 cm. high, forming dense clumps; blades capillary, somewhat flexuous, involute, scabrous; panicles narrow but rather open, 8–12 cm. long; glumes 4 mm. long; lemma equaling the glumes, scaberulous above, the callus hairs short and scant; awn attached near the base of the lemma, exserted 1–2 mm.; rachilla 2 mm. long, short-pilose.

Cuzco: Hills near Cuzco, 3,500 m., *Weberbauer 4873*, type.—Puno: Araranca, *Stordy*.

Calamagrostis vicunarum (Wedd.) Pilger, Bot. Jahrb. 42: 62. 1908. *Deyeuxia vicunarum* Wedd. Bull. Soc. Bot. France 22: 177. 1875. *C. vicunarum* var. *abscondita* Pilger, op. cit. 63. 1908. *C. vicunarum* var. *elatior* Pilger, op. cit. 63. 1908. *C. vicunarum* var. *humilior* Pilger, op. cit. 62. 1908. *C. vicunarum* var. *minima* Pilger, op. cit. 63. 1908. *C. vicunarum* var. *setulosa* Pilger, op. cit. 63. 1908. *C. vicunarum* var. *tenuior* Pilger, op. cit. 63. 1908.

Plants low, commonly 5–30 cm. high, densely tufted and often forming low rounded mounds, the culms slender and glabrous, erect; blades filiform, involute, flexuous and often curled, scaberulous, chiefly basal; panicles spike-like, often much reduced, 1–6 cm. long; glumes 6 mm. long; lemma firm, terete, ending in 4 slender teeth, the awn arising below the middle; rachilla 1 mm. long, sparsely pilose.

Ancash: Near Chonta, Cordillera Negra, Prov. Cajatambo, 4,400 m., *Weberbauer 2782*, type of var. *tenuior*.—Junín: Between Yauli and Pachichaca, 4,100 m., *Weberbauer 312*, type of var. *abscondita*. Huarón, 4,200 m., rocky slopes, *1156*. Between Tarma and Jauja, 4,500 m., *Killip & Smith 21950*. Mount La Juntai, 4,700 m., *Killip & Smith 22094*.—Lima: Río Blanco, 4,500 m., upland slopes, *787*.—Puno: Between Poto and Ananea, 4,600 m., *Weberbauer 954*, type of var. *humilior; Weberbauer 953*, type of var. *minima*. Between Cuyocuyo and Poto, 4,100 m., *Weberbauer 943*, type of var. *setulosa; Weberbauer 938*, type of var. *elatior*. Ecuador to Bolivia.

Var. *minima* is a rather distinct form, noteworthy for its very short, curled blades, low stature, and much reduced spikes. It is represented by *Macbride & Featherstone 1156* from Huarón.

Calamagrostis violacea (Wedd.) Hitchc. Contr. U. S. Nat. Herb. 24: 377. 1927. *Deyeuxia violacea* Wedd. Bull. Soc. Bot. France 22: 179. 1875.

A pale erect perennial, forming dense clumps, 10–30 cm. high, the culms slender and wiry; blades stiff, involute, flexuous, chiefly basal; panicles narrow but sometimes rather open, often purple, 2–4 cm. long.

Arequipa: Near Sumbai, 4,000 meters, *Weberbauer 6900, 6898, 6904*.—Moquehua: Carumas, 4,500 meters, *Weberbauer 7317*.—Puno: Lagunillas, *Harlan*. Also in Bolivia.

The following species of *Deyeuxia*, presumably referable to the genus *Calamagrostis*, have been recorded from Peru: *D. breviaristata* Wedd. Bull. Soc. Bot. France 22: 177. 1875 (type collected in Peru by Weddell); *D. polystachya* Wedd. loc. cit. (type collected by Weddell; *Stylagrostis polystachya* Mez, Bot. Archiv Mez 1: 20. 1922); *D. scabriuscula* Wedd. loc. cit. (type collected by Weddell); *D. trichodonta* Wedd. op. cit. 176. (type collected by Weddell). Although these were given names by Weddell, no formal descriptions have been published, and the status of the plants thus named is uncertain.

36. AGROSTIS L.

Mostly perennials with long narrow blades and narrow or open panicles of small spikelets; spikelets 1-flowered, disjointing above the glumes, the rachilla usually not prolonged; glumes equal or subequal, acute or awn-pointed, keeled, commonly scabrous on the keel and sometimes on the back; lemma obtuse, commonly shorter and thinner than the glumes, awnless or dorsally awned; palea usually shorter than the lemma, usually small and nerveless or obsolete.

Palea evident, commonly about half as long as the lemma.

Lemma awned ..... *A. gelida.*

Lemma not awned

Rachilla prolonged behind the palea; lemma equaling the glumes; spikelets 1 mm. long ..... *A. trichodes.*

Rachilla not prolonged; lemma shorter than the glumes; spikelets 2–3 mm. long.

Panicle somewhat open and spreading ..... *A. stolonifera.*

Panicle dense, more or less lobed or interrupted. *A. verticillata.*

Palea minute or wanting.

Panicle open, the spikelets not crowded ..... *A. perennans.*

Panicle narrow and more or less condensed.

Panicles spike-like, usually less than 5 cm. long and 5 mm. thick. Low alpine plants.

Lemma awned ..... *A. Haenkeana.*

Lemma not awned ..... *A. breviculmis.*

Panicles more than 5 cm. long, spike-like or somewhat open.

Blades firm, stiff, erect, flat, with a sharp involute point. *A. nigritella.*

Blades more lax, not stiff, erect, and sharp-pointed.

Spikelets 3 mm. long, usually purple; lemma 2 mm. long; panicles rather loose ..... *A. araucana.*

Spikelets 2 mm. long, usually green; lemma 1.5 mm. long; panicles condensed but more or less interrupted. *A. tolucensis.*

Agrostis araucana Philippi, Anal. Univ. Chile 94: 14. 1896.

A loosely or densely cespitose perennial 30–50 cm. high with slender culms; blades elongate, green, flat or loosely involute;

panicles narrow, 8–15 cm. long, the slender branches ascending or appressed; spikelets pale green; glumes 3 mm. long; lemma with a bent awn.

Cuzco: Tambo Tres Cruces, 3,760 meters, *Weberbauer 6923.*—Huánuco: Mito, *1800.*—Junín: Gollarisquisga, *Hitchcock 22291.* Colombia to Chile.

Agrostis breviculmis Hitchc. U. S. Dept. Agr. Bur. Pl. Ind. Bull. 68: 36. *pl. 18.* 1905. *Trichodium nanum* Presl, Rel. Haenk. 1: 243. 1830. *A. nana* Kunth, Rév. Gram. 1: Suppl. 18. 1830, non Del. 1800.

A densely cespitose perennial, forming tussocks, the stiff culms mostly less than 10 cm. high; blades short, involute, sharp-pointed; panicles spike-like, usually 1–3 cm. long; glumes 2 mm. long; lemma awnless.

Ayacucho: Between Huanta and Hacienda Parcora, 4,150 meters, *Killip & Smith 22195.*—Junín: Hacienda Atocsaico, 4,000 meters, common on rocky slopes, *Hitchcock 22205.* Ecuador to Chile. Type collected in Peru by Haenke.

Agrostis gelida Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 4, pt. 1: 343. 1841.

Plants perennial, loosely cespitose, 1 meter high or less; blades flat, very narrow, much elongate; panicles narrow but lax, mostly purplish, the branches whorled; glumes 3 mm. long; awn of the lemma bent and short-exserted.

Cuzco: Ollantaitambo, *Hitchcock 22533.*—Huánuco: Tambillo, 2,400 meters, hillside, *3584.* Six miles south of Mito, 3,000 meters, *1847.* Fifteen miles northeast of Huánuco, 3,650 meters, common on hillsides, *2180.*—Junín: Pasco, *Poeppig,* type. Gollarisquisga, *Hitchcock 22331.* Also in Bolivia.

Agrostis Haenkeana Hitchc. Contr. U. S. Nat. Herb. 24: 381. 1927. *A. mucronata* Presl, Rel. Haenk. 1: 238. 1830, non Spreng. 1825.

Perennial, densely cespitose, spreading or erect, 5–30 cm. high; blades mostly basal, erect, narrow, flat or involute; panicles spike-like, 3–7 cm. long; glumes 2 mm. long; lemma awned.

Junín: Hacienda Atocsaico, *Hitchcock 22202.*—Puno: Sachapata, *Lechler 2604.* Ecuador to Bolivia. Type collected by Haenke, probably in Peru.

Agrostis nigritella Pilger, Bot. Jahrb. 25: 713. 1898.

Plants stout, perennial, densely cespitose, 10–30 cm. high; blades flat or somewhat involute; panicles dense, narrow, almost spike-like, dark purple, 5–10 cm. long; glumes 3–4 mm. long; lemma with a bent awn from below the middle; palea absent.

Junín: Hacienda Runatuyo, 4,500 meters, *Weberbauer 6631*. Ecuador.

Agrostis perennans (Walt.) Tuckerm. Amer. Journ. Sci. 45: 44. 1843. *Cornucopiae perennans* Walt. Fl. Carol. 74. 1788. *A. Weberbaueri* Mez, Repert. Sp. Nov. 18: 1. 1922.

A lax perennial, slender and often decumbent, 40–80 cm. high; blades narrow, elongate, flat; panicles rather diffuse, 10–20 cm. long, the branches capillary, whorled; spikelets usually purplish, not awned.

Huánuco: Tambo de Vaca, 3,900 meters, edge of woods, *4396*. Monzón, *Weberbauer*, part of type material of *A. Weberbaueri*.—Junín: Huacapistana, *Weberbauer*, part of type of *A. Weberbaueri*. Gollarisquisga, 4,000 meters, wet stream bank, *Hitchcock 22330*.—Puno: Sachapata, *Lechler 2640a*. Bolivia to the United States.

Agrostis stolonifera L. var. **maritima** (Lam.) Koch, Syn. Deutsch. Schweiz. Fl. 781. 1837. *A. maritima* Lam. Encycl. 1: 61. 1783.

A spreading perennial, the culms erect from a creeping base; blades flat, narrow, green; panicles contracted, almost spike-like; spikelets not awned.

Arequipa: Arequipa, *Günther 13*. Native of Europe, but naturalized in America.

Agrostis tolucensis HBK. Nov. Gen. & Sp. 1: 135. 1816. *Vilfa glomerata* Presl, Rel. Haenk. 1: 239. 1830. *A. glomerata* Kunth, Rév. Gram. 1: Suppl. 17. 1830.

Perennial, erect or somewhat spreading, 10–50 cm. high or more; blades flat or loosely involute; panicles narrow, rather dense or spike-like, often interrupted, 5–20 cm. long, green or purplish; glumes 2–3 mm. long; awn present or absent.

Amazonas: Chachapoyas, *Mathews 3240*.—Cuzco: Ollantaitambo, *Hitchcock 22534*.—Huánuco: Tambo de Vaca, 3,900 meters, wet mossy rocky soil, *4357*.—Junín: Huacapistana, 2,000 meters, open hillside, *Killip & Smith 24504*.—Lima: Río Blanco, 3,200

meters, open hillside, *Killip & Smith 21689*. Chile to Mexico. Type of *Vilfa glomerata* collected in Peru.

Agrostis trichodes (HBK.) R. & S. Syst. Veg. 2: 361. 1817. *Vilfa trichodes* HBK. Nov. Gen. & Sp. 1: 139. 1816.

A delicate cespitose perennial, the culms 10–20 cm. high; blades slender, involute, chiefly basal; panicles delicate, open, 2–5 cm. long; glumes broad, equal, 1 mm. long; lemma obtuse, equaling the glumes.

Cajamarca (?): Type from region of Santa Cruz and Huambos, *Bonpland*. Ranging to Venezuela and Colombia, in the higher mountains.

Agrostis verticillata Vill. Prosp. Pl. Dauph. 16. 1779.

Perennial, decumbent or spreading, the culms 20–40 cm. long, sometimes even 1 meter long; blades flat; panicles dense, more or less interrupted and lobed, 5–15 cm. long.

Arequipa: Arequipa, *Hitchcock 22437*.—Junín: Gollarisquisga, *Hitchcock 22296*.—Lima: Lima, *Hitchcock 22337½*. Native of the Old World, but widely naturalized in America.

37. CINNA L.

Perennials with flat blades and loose panicles; spikelets 1-flowered, disjointing below the glumes, the rachilla forming a stipe below the floret and produced behind the palea as a minute bristle; glumes equal, 1-nerved; lemma similar to the glumes and almost as long, 3-nerved, bearing a minute short straight awn just below the apex; palea apparently 1-nerved, 1-keeled.

Cinna poaeformis (HBK.) Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. 24: 21. 1901. *Deyeuxia poaeformis* HBK. Nov. Gen. & Sp. 1: 146. 1816.

Plants rather lax and slender, about 1 meter high; blades flat, 8 mm. wide or less, bright green, elongate; panicle narrow but open, 40 cm. long or less, the branches ascending or spreading, naked below, rather densely flowered above; spikelets 3 mm. long, green or purplish.

Huánuco: Mito, 2,700 meters, sunny stream bank, *3365*. Extending to Mexico.

38. ALOPECURUS L.

Annuals or perennials, erect or decumbent, with long narrow blades; inflorescence a dense terete spike-like panicle; spikelets

1-flowered, disjointing below the glumes, strongly compressed laterally; glumes equal, ciliate on the keel; lemma about equaling the glumes, awned on the back.

Panicles slender, 3–5 cm. long, 3–4 mm. thick.....*A. aequalis.*
Panicles stout, 2–3 cm. long, 8–10 mm. thick.....*A. bracteatus.*

Alopecurus aequalis Sobol. Fl. Petrop. 16. 1799. *A. aristulatus* Michx. Fl. Bor. Amer. 1: 43. 1803.

Plants perennial, glabrous, erect or decumbent, the culms 20–50 cm. tall; blades flat, 2–3 mm. wide; awns scarcely extending beyond the spikelets; panicles green.

Junín: Cerro de Pasco, floating in shallow ponds and sink holes, 4,200 meters, *3078.* Widely distributed in both hemispheres.

Alopecurus bracteatus Phil. Anal. Univ. Chile 94: 6. 1896.

Plants erect, glabrous, somewhat succulent, 1 meter high or less; blades rather stiff, often short, the sheaths more or less inflated; panicles silky, short and blunt, purplish: awns about 2 mm. long.

Junín: Huarón, wet slope, 4,200 meters, *1133.* Gollarisquisga, *Hitchcock 22334.* Chile.

39. POLYPOGON Desf.

Annuals or perennials with flat narrow blades, the panicles dense and often spike-like; spikelets 1-flowered, the pedicel disjointing below the glumes, leaving a short-pointed callus attached; glumes equal, entire or 2-lobed, awned from the tip or between the lobes, the awn slender and straight; lemmas much shorter than the glumes, hyaline, usually bearing a slender straight awn shorter than the awns of the glumes.

Glumes, excluding the awns, about 2 mm. long, gradually narrowed into the awn.....*P. elongatus.*
Glumes 1.5–2 mm. long.
Glumes 2 mm. long, abruptly rounded at the apex.....*P. lutosus.*
Glumes 1.5 mm. long, with an awn 6–8 mm. long..*P. monspeliensis.*

Polypogon elongatus HBK. Nov. Gen. & Sp. 1: 134. 1816. *Raspailia agrostoides* Presl, Rel. Haenk. 1: 239. *pl. 80.* 1830. *Nowodworskya agrostoides* Presl, op. cit. 351. 1830.

Plants perennial, lax, commonly decumbent, 1 meter high or less, the blades green, elongate; panicles interrupted, nodding, often purplish, 10–20 cm. long.

Arequipa: Arequipa, *Hitchcock 22431*.—Cuzco: Cuzco, *Hitchcock 22487*.—Huánuco: Mito, 2,700 meters, *1672b*.—Lima: Lima, *Mathews 545*.—Junín: Between Tarma and La Merced, *Hitchcock 22152½*. Argentina to Mexico.

Polypogon lutosus (Poir.) Hitchc. U. S. Dept. Agr. Bull. 772: 138. 1920. *Agrostis littoralis* With. Bot. Arr. Veg. Brit. ed. 3. 2: 129. 1796, non Lam. 1791. *P. littoralis* Smith, Comp. Fl. Brit. 13. 1800. *A. lutosa* Poir. in Lam. Encycl. Suppl. 1: 249. 1810.

A spreading perennial, the slender decumbent culms 1 meter long or less, often rooting at the lower nodes; blades elongate, flat, green; panicles dense, more or less interrupted, green or purplish, 15 cm. long or less.

Arequipa: Arequipa, *Hitchcock 22433*.—Cuzco: Cuzco, moist open soil, *Hitchcock 22476*.—Junín: Tarma, *Hitchcock 22172*.—Lima: Matucana, 2,400 meters, ditch bank, *377*. Lima, *Hitchcock 22337*. Native of the Mediterranean region; widely distributed in America, but apparently introduced.

Polypogon monspeliensis (L.) Desf. Fl. Atlant. 1: 67. 1798. *Alopecurus monspeliensis* L. Sp. Pl. 61. 1753. *P. flavescens* Presl, Rel. Haenk. 1: 234. 1830.

A low and spreading annual; sheaths inflated, the blades flat, elongate; panicles dense, oblong, silky-awned; glumes hispidulous, the awn arising between the 2 rounded lobes.

Type of *P. flavescens* collected in Peru by Haenke, the locality unknown. The species is widely distributed in both hemispheres.

40. LYCURUS HBK.

Low perennials; panicles dense and spike-like, narrow, the spikelets borne in pairs, 1-flowered, the lower one of the pair sterile; rachilla jointed above the glumes; glumes awned, the first usually 2-awned; lemma narrow, firm, longer than the glume, terminated by a slender awn.

Lycurus phleoides HBK. Nov. Gen. & Sp. 1: 142. *pl. 45*. 1816.

Plants loosely or densely cespitose, the culms wiry, decumbent, 30 cm. long or less; blades short, crowded, flat or folded; panicles 2–5 cm. long, about 5 mm. thick.

Junín: Tarma, *Hitchcock 22169*. Argentina to the southwestern United States.

41. MUHLENBERGIA Schreb.

Annuals or perennials with narrow blades; panicles narrow or open; spikelets 1-flowered, the rachilla disjointing above the glumes; glumes usually shorter than the lemma, obtuse to acuminate or awned, the first rarely obsolete; lemma firm-membranaceous, 3–5-nerved, with a very short, usually minutely pilose callus, the apex acute, terminating in a straight or flexuous awn, or sometimes merely mucronate.

Plants annual; culms branched, delicate; lemma bearing a delicate awn.

Glumes, at least some of them, awned, the awn as long as the body of the glume or longer.

Branches of the panicle divaricate or recurved, falling entire. *M. diversiglumis.*

Branches of the panicle not falling entire..... *M. ciliata.*

Glumes not awned, often acute or acuminate.

Second glume broad, 3-toothed; awn flexuous.... *M. peruviana.*

Second glume entire; awn straight.

Glumes acute or mucronate; body of the lemma 1.5 mm. long. *M. tenuissima.*

Glumes obtuse; body of the lemma 2–3 mm. long. *M. microsperma.*

Plants perennial.

Plants low and spreading, the blades less than 3 cm. long; lemmas acute or cuspidate but not awned.

Blades flat; culms decumbent-spreading, without scaly rhizomes. *M. ligularis.*

Blades involute, falcate; scaly rhizomes present... *M. fastigiata.*

Plants erect or decumbent, not low and spreading; lemmas acute or awned.

Glumes unequal, 3 and 4 mm. long; blades less than 5 cm. long; awn flexuous..... *M. flexuosa.*

Glumes equal or nearly so, 1.5–2 mm. long; blades more than 5 cm. long; awn, if present, straight or nearly so.

Panicles dense and spike-like, stiffly erect; glumes more than half as long as the lemma..... *M. angustata.*

Panicles narrow but not dense and spike-like; glumes less than half as long as the lemma..... *M. rigida.*

Muhlenbergia angustata (Presl) Kunth, Rév. Gram. 1: Suppl. 16. 1830. *Podosaemum angustatum* Presl, Rel. Haenk. 1: 229. 1830.

Perennial, densely cespitose, erect, rather stout, 1 meter high or less; blades long and narrow, firm, folded, scabrous, the ligule 5–10 mm. long; panicles dense and spike-like, lead-colored or tawny, 10–20 cm. long; glumes 6–7 mm. long, acuminate or awn-pointed, scaberulous; lemma about equaling the glumes, scaberulous, acuminate or bearing a slender straight awn as much as 6 mm. long.

Huánuco: Mito, 2,700 meters, grassy uplands and open slopes, *1721, 1424, 1929.*—Junín: Yanahuanca, 3,000 meters, shrubby slope, *1204.* La Oroya, 3,000 meters, river bottom, *Hitchcock 22182.* Colombia to Argentina. Type collected by Haenke somewhere in Peru.

Muhlenbergia ciliata (HBK.) Kunth, Rév. Gram. 1: 63. 1829. *Podosaemum ciliatum* HBK. Nov. Gen. & Sp. 1: 128. 1816.

A delicate tufted annual 10–20 cm. high, erect or ascending; blades short, flat, spreading, narrow; panicles narrow, dense or rather loose and open, green or purplish, one-third to half the length of the plant; lemmas ciliate.

Huánuco: Mito, 2,700 meters, mossy banks on grassy hillside, *3376.* Piedra Grande, 1,500 meters, steep slopes, *3684.* Extending to Mexico.

Muhlenbergia diversiglumis Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 4, pt. 1: 298. 1841.

A slender delicate annual, erect or ascending, 30 cm. high or less; blades bright green, flat, narrow, spreading; panicle narrow, green, rather lax, few-flowered, the branches with only 1–3 spikelets.

Ayacucho: Aina, open hillside, 800 meters, *Killip & Smith 23127.*—Cuzco: San Miguel, *Cook & Gilbert 958.* Extending to Mexico.

Muhlenbergia fastigiata (Presl) Henr. Med. Rijks Herb. 40: 59. 1921. *Sporobolus fastigiatus* Presl, Rel. Haenk. 1: 241. 1830.

Plants low and densely tufted, pale green, with numerous wiry creeping rootstocks, the culms decumbent, 10 cm. high or less; blades numerous, distichous, falcate, involute, rather rigid, mostly less than 1 cm. long; panicles small and narrow, few-flowered, lead-colored, the spikelets 2 mm. long.

Cuzco: Between Santa Rosa and Araranca, *Cook & Gilbert 168*. Junín: La Oroya, *Hitchcock 22135*.—Puno: Chuquibambilla, *Hitchcock 22448*. Bolivia and Argentina. Type collected in Peru by Haenke.

Muhlenbergia flexuosa Hitchc. Contr. U. S. Nat. Herb. 24: 388. 1927.

A slender cespitose perennial, the culms wiry, 40 cm. long or less; blades flat, scabrous, 2–4 cm. long, 1–2 mm. wide; panicles narrow, dense and almost spike-like, 4–7 cm. long, green or purplish; awns 2 cm. long.

Huánuco: Huacachi, 1,950 meters, summit of rocky crest, *3874*, type. Río Huallaga canyon below Río Santo Domingo, 1,200 meters, crevices of vertical cliff, *4205*.

Muhlenbergia ligularis (Hack.) Hitchc. Contr. U. S. Nat. Herb. 24: 388. 1927. *Sporobolus ligularis* Hack. Oesterr. Bot. Zeitschr. 52: 57. 1902.

Perennial, loosely tufted, decumbent-spreading; blades flat, 1–2 cm. long; panicles small, the spikelets 2 mm. long.

Junín: Hacienda Atocsaico, *Stordy 27*. Ecuador to Bolivia.

Muhlenbergia microsperma (DC.) Kunth, Rév. Gram. 1: 64. 1829. *Trichochloa microsperma* DC. Cat. Hort. Monsp. 151. 1813.

A spreading or erect annual, much branched from the base, very slender; blades flat, narrow, bright green; panicles numerous, narrow, rather lax, green or purplish; awns 1–1.5 cm. long.

Huánuco: Huánuco, 2,100 meters, moist swales and disintegrating rock outcrops, *3217*, *3514*.—Lima: Matucana, 2,400 meters, rocky slope, *392*. Ranging to Mexico.

Muhlenbergia peruviana (Beauv.) Steud. Nom. Bot. ed. 2. 1: 41. 1840. *Clomena peruviana* Beauv. Ess. Agrost. 28. 1812. *M. clomena* Kunth, Rév. Gram. 1: 64. 1829. *Agrostis delicatula* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

A delicate tufted annual, much branched at the base, 5–20 cm. high, or often not more than 2–3 cm., the culms erect; blades erect, very short and narrow; panicles mostly narrow and compact, sometimes open and ovoid, commonly 1–2 cm. long, sometimes reduced to only a few flowers, green or purplish.

Cuzco: Tinta, *Cook & Gilbert 211*.—Huánuco: 15 miles southeast of Huánuco, 3,150 meters, grassy bank, *2114*. Cani, 2,550

meters, open upland slopes, *3401.*—Junín: Yauli, 4,050 meters, rather dry rock ledges, *916.* La Oroya, 3,600 meters, stony flats, *984.*—Lima: Matucana, 2,400 meters, moist slopes, *450.* Río Blanco, 4,500 meters, upland slopes, *800.* Antaicocha, 3,900 meters, open rocky slopes, *Pennell 14554a.*—Moquehua: Carumas, 3,200 meters, *Weberbauer 7295.*—Puno: San Antonio, *Lechler 1813b,* type of *Agrostis delicatula.* Pucará, *Weberbauer 415,* in part. Araranca, 4,200 meters, *Pennell 13466.* Chuquibambilla, 4,000 meters, rocky clay slope over limestone, *Pennell 13375.*—Without locality: *Weberbauer 5456.* Argentina to Mexico. Type from Peru.

Muhlenbergia rigida (HBK.) Kunth, Rév. Gram. 1: 63. 1829. *Podosaemum rigidum* HBK. Nov. Gen. & Sp. 1: 129. 1816.

Perennial, densely cespitose, erect, rather stout, 1 meter high or less; blades firm, involute, the basal sheaths broad; panicles narrow, dark purple, 15–20 cm. long, the capillary branches ascending or appressed; glumes 1.5–2 mm. long, the lemma 5 mm. long; awn 1–1.5 cm. long.

Ayacucho: Ayacucho, 3,100 meters, *Weberbauer 5525.*—Cuzco: Ollantaitambo, *Cook & Gilbert 514.*—Huánuco: Mito, 2,700 meters, *3320.*—Junín: Tarma, 3,100 meters, open hillside, *Killip & Smith 21802;* dry cactus hill, 3,000 meters, *Hitchcock 22165.*—Lima: Matucana, 2,400 meters, in swales on mountain side, *358.* Viso, 2,700 meters, limestone slide rock, *765.*—Without locality: *Weberbauer 6448.* Argentina to Mexico.

Some of the specimens have been distributed as *M. elegans* (Kunth) Trin.

Muhlenbergia tenuissima (Presl) Kunth, Rév. Gram. 1: Suppl. 16. 1830. *Podosaemum tenuissimum* Presl, Rel. Haenk. 1: 230. 1830.

A delicate annual; panicle loose and narrow, the branches spreading, few-flowered.

Junín: Between Tarma and La Merced, *Hitchcock 22154.* Bolivia and Brazil to Mexico.

42. TRINIOCHLOA Hitchc.

Cespitose perennials; panicles narrow and rather few-flowered; spikelets 1-flowered, the rachilla not produced beyond the floret; glumes membranaceous; lemma narrow, rounded on the back, narrower than the glumes, bearing a stout geniculate dorsal awn

attached above the middle, 2-toothed at the apex, the callus densely bearded.

Triniochloa stipoides (HBK.) Hitchc. Contr. U. S. Nat. Herb. 17: 303. 1913. *Podosaemum stipoides* HBK. Nov. Gen. & Sp. 1: 131. 1816.

Plants very slender, forming loose clumps, the culms 50–100 cm. high; sheaths scaberulous, the blades long and very narrow; panicles lax, 10–20 cm. long, the branches verticillate, distant, ascending or spreading, few-flowered; lemmas slender, 1 cm. long, the glumes one-third as long; awn stout, 1 cm. long.

Huánuco: Mito, 2,700 m., edge of thicket, *3350, 1696.* Bolivia to Mexico.

43. ACIACHNE Benth.

Perennials, forming dense cushions or tussocks, the blades short and involute; spikelets 1-flowered, perfect, solitary on short peduncles among the leaves; glumes obtuse, shorter than the fruit; lemma indurate, fusiform, extending into a short sharp point.

Aciachne pulvinata Benth. in Hook. Icon. 4: 44. *pl. 1362.* 1881. *Agrostis delicatula* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants forming large and exceedingly dense mounds or cushions, the culms only 3–5 cm. high; blades numerous, curved, about 1 cm. long, the pale sheaths broad and overlapping.

Cuzco: Valle del Paucartambo, 3,750 m., *Herrera 2324.* La Raya, wet moorland, 4,200 m., *Pennell 13488.*—Junín: Huarón, rocky slopes, 4,200 m., *1157.* Hacienda Atocsaico, near Junín, 4,000 m., *Hitchcock 22218.*—Puno: San Antonio, *Lechler 1813,* type collection of *Agrostis delicatula.* Venezuela to Peru. "Paco."

Pennell reports that the spikes are readily detached and adhere to fur or clothing.

Hitchcock (Contr. U. S. Nat. Herb. 24: 391. 1927) states that *Lechler 2599* from Sachapata, Dept. Puno, the specimen in the Kew Herbarium, probably represents another species of the genus. It differs in having straight leaves and a panicle 3–4 cm. long.

44. SPOROBOLUS R. Br.

Annuals or perennials with narrow blades, the small spikelets forming open or contracted panicles; spikelets 1-flowered, the rachilla disjointing above the glumes; glumes commonly unequal,

the second often equaling the spikelet; lemma membranaceous, 1-nerved, not awned; palea usually prominent and as long as the lemma or longer; seed free from the pericarp.

Plants with creeping scaly rootstocks.....*S. virginicus.*

Plants without creeping rootstocks.

Panicle branches in distinct whorls; panicles often pyramidal.

Spikelets 1.5 mm. long.....*S. argutus.*

Spikelets more than 3 mm. long.

Panicles mostly oblong; branchlets with spikelets nearly to the base.....*S. purpurascens.*

Panicles open, pyramidal; branches naked at the base. *S. lasiophyllus.*

Panicle branches not in whorls; panicles narrow or spike-like, sometimes 30 cm. long.

Glumes acute, more than half the length of the spikelet. *S. mirabilis.*

Glumes obtuse, less than half the length of the spikelet. *S. Berteroanus.*

Sporobolus argutus (Nees) Kunth, Enum. Pl. 1: 215. 1833. *Vilfa arguta* Nees, Agrost. Bras. 395. 1829.

Perennial, low and tufted, the culms spreading; blades short, rather thick, more or less involute; panicles pale or lead-colored, at first contracted but at maturity narrowly pyramidal.

Piura: Pariñas Valley, *Haught F90.* Argentina to the United States.

Sporobolus Berteroanus (Trin.) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 370. 1917. *Vilfa Berteroana* Trin. Mém. Acad. St. Pétersb. 4, pt. 1: 100. 1840. *V. familiaris* Steud. ex. Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants erect, perennial, densely tufted, sometimes 1 m. high; blades very narrow, flat or involute; panicles spike-like, 10–30 cm. long, lead-colored, the branches sometimes 1–2 cm. long, appressed.

Arequipa: Arequipa, *Hitchcock 22434.*—Cuzco: Cuzco, 3,600 m., *Herrera 2395a.*—Huánuco: Mito, 2,700 m., northeastern slope, *1421.*—Junín: Tarma, 2,100 m., along irrigation ditch, *1031.*—Lima: Callao, *Wilkes Exped.*—Puno: Azángaro, *Lechler 1728,* type of *Vilfa familiaris.*—San Martín: Lamas, *Spruce 4855.* Argentina to the southern United States.

Sporobolus lasiophyllus Pilger, Bot. Jahrb. 37: 504. 1906.

A densely tufted perennial from a coarse caudex, the culms erect, 20–30 cm. high; blades slender, involute, much shorter than the culms, felted about the sheaths; panicles long-exserted, lax, 2–5 cm. long, dark; spikelets 3–4 mm. long.

Huánuco: Mito, 2,700 m., northeastern slope, *3315*. Huacachi, 1,950 m., steep rocky grassland, *4073*.—Junín: Mountains near Palca, dry fields, 2,700–3,000 m., *Weberbauer 2467*, type. Tarma, 3,600 m., *Weberbauer 2381*. Reported from Colombia.

Sporobolus mirabilis Pilger, Bot. Jahrb. 56: Beibl. 123: 27. 1920.

A stout perennial 1 m. high or more; blades flat, much elongate, 1–1.5 cm. wide; lower sheaths finally spirally curved and weathering into coarse fibers; panicle narrow and rather dense, pale, about 30 cm. long, the long branches appressed; spikelets 2.5 mm. long.

Cajamarca: Between Shumba and Jaen, 700 m., *Weberbauer 6186*, type collection.

Sporobolus purpurascens (Sw.) Hamilt. Prodr. Ind. Occ. 5. 1825. *Agrostis purpurascens* Sw. Prodr. Veg. Ind. Occ. 25. 1788.

A slender erect tufted perennial; blades flat or folded, mostly basal and much shorter than the culms; panicle 10–15 cm. long, narrow and often almost spike-like, the short branches commonly in rather distinct whorls, spikelet-bearing to the base.

San Martín: San Roque, 1,400 m., in pasture, *Williams 7533*. Brazil to the southern United States.

Sporobolus virginicus (L.) Kunth, Rév. Gram. 1: 67. 1829. *Agrostis virginica* L. Sp. Pl. 63. 1753. *Vilfa luxurians* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants with long-creeping hard scaly rhizomes, the culms stout, erect, 15–40 cm. high; leaves numerous, stiff, involute-pointed, conspicuously distichous; panicles very dense and spike-like, 5 cm. long or less.

Arequipa: Mollendo, *Hitchcock 22353*.—Libertad: Salaverry, on beach, *47a*.—Lima: Callao, *Wilkes Expd*. Widely dispersed in America in sandy or saline soil.

45. NASSELLA Desv.

Low cespitose perennials with narrow blades and narrow panicles; differing from *Stipa* in the obliquely obovate fruit, gibbous at the

summit, and in the excentrically attached awn; palea short, membranaceous, without nerves or keels.

Nassella pubiflora (Trin. & Rupr.) Desv. in Gay, Fl. Chil. 6: 264. 1853. *Urachne pubiflora* Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5, pt. 1: 21. 1842. *U. laevis* Trin. & Rupr. loc. cit. *U. Meyeniana* Trin. & Rupr. loc. cit. *Calamagrostis anomala* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *Oryzopsis caespitosa* var. *peruviana* Ball, Journ. Linn. Soc. Bot. 22: 58. 1885. *Piptochaetium laeve* Pilger, Bot. Jahrb. 56: Beibl. 123: 26. 1920.

Perennial, densely tufted, 20–50 cm. high, erect or spreading; blades flat or involute, short or elongate, slender; panicles narrow or occasionally open, 5–15 cm. long, the branches chiefly appressed, many-flowered, floriferous to the base; fruit flattish, pubescent or glabrous, 1.5–2 mm. long.

Arequipa: Arequipa, *Hitchcock 22438*.—Ayacucho: Pampalca, 3,200 m., open hillside, *Killip & Smith 22259*.—Cuzco: Cuzco, roadsides and in fields, *Hitchcock 22481*.—Junín: Tarma, 3,000 m., dry cactus hills, *Hitchcock 22164*; 3,600 m., loose slopes, *1065*.—Lima: Rimac Valley, *Ball* in 1882, type of *O. caespitosa* var. *peruviana*. Río Blanco, 3,600 m., rocky river slope, *731*. La Oroya, 3,600 m., limestone river cliffs, *956*. Matucana, 2,400 m., dry steep rock outcrop, *228*.—Moquehua: Sailapa, 3,600 m., grass steppe, *Weberbauer 7339*.—Puno: Azángaro, *Lechler 1736*, type of *Calamagrostis anomala*. Also in Ecuador and Chile. Type collected in Peru by Meyen. Type of *Urachne laevis* collected by Meyen in Peru.

One of the Peruvian collections was distributed as *Nassella chilensis* (Trin.) Desv.

46. PIPTOCHAETIUM Presl

Perennials with narrow elongate blades; similar to *Nassella*, but differing in the coriaceous palea, with 2 keels and a deep furrow between them, the tip projecting beyond the lemma.

Piptochaetium setifolium Presl, Rel. Haenk. 1: 222. 1830. *Stipa setifolia* Kunth, Enum. Pl. 1: 182. 1833. *Urachne simplex* var. *peruviana* Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5, pt. 1: 23. 1842.

Plants densely cespitose, 30 cm. high or less, the slender culms erect; blades mostly basal, involute; panicles narrow, few-flowered, 2–4 cm. long; fruit smooth, minutely striate.

Type collected in Peru by Haenke, the locality unknown. The species occurs also in Colombia.

47. STIPA L.

Perennials, the blades usually convolute; panicles narrow; spikelets 1-flowered, disjointing above the glumes, the joint oblique, leaving a bearded sharp-pointed callus attached to the base of the floret; glumes membranaceous, often papery, acute or acuminate, usually long and narrow; lemma narrow, terete, firm or indurate, terminating in a bent and twisted, persistent awn; palea enclosed in the convolute lemma.

Awn strongly plumose.....*S. plumosa.*

Awn not plumose, often pubescent or villous.

Fruiting lemma not more than 3 mm. long; panicle long, narrow, dense.

Summit of the lemma bearing a dense ring of long hairs..*S. ichu.*

Summit of the lemma without a ring of hairs.....*S. Smithii.*

Fruiting lemma more than 3 mm. long or, if not, the panicle not long and dense.

Upper part of lemma pilose with long hairs longer than those of the body.

Throat of the sheath villous.....*S. nardoides.*

Throat of the sheath glabrous.....*S. Hans-Meyeri.*

Upper part of the lemma not conspicuously pilose, or the hairs not longer than those of the body.

Summit of the lemma smooth, cylindric, forming a crown usually slightly longer than the neck, often whitish.

Fruit 5–8 mm. long.

Fruit pubescent, at least in lines, to the summit, 5–6 mm. long.....*S. mucronata.*

Fruit pubescent only on the lower part, about 8 mm. long.....*S. Neesiana.*

Fruit less than 5 mm. long.

Fruit obovate, turgid, 2.5–3 mm. long....*S. inconspicua.*

Fruit fusiform.

Fruit nearly glabrous above, 3.5 mm. long..*S. mexicana.*

Fruit pubescent with appressed white hairs.

Fruit 2.5–3 mm. long.....*S. depauperata.*

Fruit 4 mm. long.....*S. brachphylla.*

Summit of the lemma not crowned.

Plants annual.....*S. annua.*

Plants perennial.

Body of the lemma pubescent.

Fruit 3 mm. long.....*S. Featherstonei.*

Fruit 5 mm. long.....*S. Macbridei.*

Body of the lemma glabrous.

Fruit 4 mm. long; awn 2 cm. long.....*S. peruviana.*

Fruit 3 mm. long; awn 1 cm. long.

Glumes obtuse, 3 mm. long.....*S. obtusa.*

Glumes acute, 5 mm. long.....*S. rigidiseta.*

Stipa annua Mez, Repert. Sp. Nov. 17: 204. 1921.

Plants erect or spreading, branched from the base, 10–20 cm. high; blades very narrow and slender; panicles green, narrow and rather dense, the long slender awns conspicuous; awn with scattered long hairs on the first segment.

Arequipa: Mollendo, *Johnston 3536.* Tingo, 2,200 meters, open rocky slopes, *Pennell 13139.*—Lima: Mountains near Chosica, 1,700 meters, *Weberbauer 5353,* type collection.—Moquehua: Mt. Estuquiña, 1,700 meters, *Weberbauer 7442.*

Stipa brachyphylla Hitchc. Contr. U. S. Nat. Herb. 24: 275. 1925.

Plants densely cespitose, erect or spreading, 20–40 cm. high; blades slender, short and involute, chiefly basal; panicles narrow, rather dense or lax, few-flowered, 5–15 cm. long, green or purple.

Junín: La Oroya, base of hills, common, 3,000 meters, *Hitchcock 22183.* Cerro de Pasco, bank of railway cut, 4,200 meters, *Hitchcock 22243.* Between La Oroya and La Merced, 3,000 meters, dry cactus hill, *Hitchcock 22161.*—Lima: Río Blanco, 3,600 meters, steep grassy slope, *Macbride & Featherstone.* Department uncertain: Between Juliaca and Cuzco, *Hitchcock 22444.* To Ecuador and Argentina.

Stipa depauperata Pilger, Bot. Jahrb. 56: Beibl. 123: 23. 1920. *S. depauperata* var. *humilis* Pilger, loc. cit. *S. depauperata* var. *glabrata* Pilger, loc. cit.

Plants erect or ascending, densely cespitose, 20–60 cm. high; blades short, erect, mostly basal, narrow and involute; panicles narrow, rather loose, purplish or brownish, 10–15 cm. long.

Ancash: Caraz, *Weberbauer 3076*, type of var. *glabrata*.—Arequipa: Near Sumbai 4,000 meters, *Weberbauer 6903*, type collection; *6906*.—Junín: La Oroya, *Weberbauer 2615*, type of var. *humilis*. Ecuador and Bolivia.

Stipa Featherstonei Hitchc. Proc. Biol. Soc. Wash. 36:196. 1923.

Plants erect, densely cespitose, 20–40 cm. high; blades slender, involute, rather soft, shorter than the culms; panicles narrow and almost spike-like, purple, dense, 3–5 cm. long.

Lima: Río Blanco, upland slope, 4,500 meters, *803a*, type.

Stipa Hans-Meyeri Pilger, Bot. Jahrb. 56: Beibl. 123: 24. 1920. *S. nivalis* Steud. ex. Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants stout, forming dense clumps, commonly 30–60 cm. high; blades involute, rather slender but stiff, equaling or shorter than the culms; panicles deep purple, narrow, dense and spike-like, 5–9 cm. long.

Cuzco: Tambo Tres Cruces, 3,700 meters, *Weberbauer 6966*.—Junín: Cerro de Pasco, moist places on hills, 4,200 meters, *Hitchcock 22241*.—Lima: Río Blanco, 4,500 meters, upland slope, *803*.—Puno: Sandía, *Weberbauer 1025*. Between Cuyocuyo and Poto, *Weberbauer 940*. Ayapata, *Lechler 1978*, type of *S. nivalis*. Ecuador to Bolivia.

Stipa ichu (R. & P.) Kunth, Rév. Gram. 1: 60. 1829. *Jarava ichu* R. & P. Fl. Peruv. 1: 5. *pl. 6, f. b*. 1798. *S. pungens* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 19. 1841.

Plants erect, forming large dense clumps, 1.5 meters high or less; blades slender, rather stiff, involute, elongate; panicles narrow, often spike-like, silky, white, tawny, or purplish, mostly 15–40 cm. long.

Arequipa: Above Chivai, 4,000 meters, *Weberbauer 6893*.—Cuzco: Cuzco, *Hitchcock 22460*.—Junín: La Oroya, 3,600 meters, loose stony soil, *952*. Tarma, 3,100 meters, *Killip & Smith 21851*. Matucana, 2,400 meters, loose moist soil and dry rocky slopes, *335, 254*. Río Blanco, grassy slopes, 3,600 meters, *645, 644; Killip & Smith 21599, 21632*.—Puno: Chiquibambilla, 3,900 meters, rocky slope on puna, *Pennell 13413*. Argentina to Mexico. In their original description Ruiz and Pavón report the plant from Canta, Jauja, Huarochiri, Huancavelica, Tarma, Huánuco, and Huamalies. *S. pungens* was described from Peru. "Ichu," "ocssa." "paja de puna."

Ichu grass is one of the most important economic plants of Peru, valuable above all as pasture for stock. It is employed also for thatching, in making adobe bricks, for packing and torches, and an infinite number of other purposes.

Stipa inconspicua Presl, Rel. Haenk. 1: 227. 1830. *Urachne Haenkeana* Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5, pt. 1: 20. 1842. *Nassella caespitosa* Griseb. Abh. Ges. Wiss. Goett. 19: 258. 1874.

Plants cespitose, slender, 1 meter high or less; blades slender, elongate, flat or involute; panicles narrow or rather lax and open, 5–20 cm. long, dark purple, many-flowered.

Cuzco: Cuzco, *Hitchcock 22452.*—Junín: La Quinhua, 3,600 meters, in potato field, *2033.*—Lima: Río Blanco, 3,600 meters, western slope, *648.*—Puno: Juliaca, *Harlan* in 1914. Ecuador to Argentina. Probably based originally on Peruvian material.

Stipa Macbridei Hitchc. Proc. Biol. Soc. Wash. 36: 197. 1923.

Plants slender, branched, somewhat woody, straggling, 1 meter high or less; blades rather short, flat below and capillary-involute above; panicles narrow, lax, green or purplish, 15–30 cm. long.

Huánuco: Ambo, 2,100 meters, stony cliff, *3176.*—Lima: Matucana, 2,400 meters, disintegrated rock slopes, *452*, type.—Uspachaca, 2,550 meters, rock ledge, *1317.*

Stipa mexicana Hitchc. Contr. U. S. Nat. Herb. 24: 247. 1925.

Plants tufted, slender, erect, 60 cm. high or less, sometimes sprawling or prostrate; blades narrow, flat or involute, mostly basal; panicles narrow, dark purple, rather loose, 5–15 cm. long.

Huánuco: Mito, grassy uplands, 3,150 meters, *1876.* Ranging to Mexico.

Stipa mucronata HBK. Nov. Gen. & Sp. 1: 225. 1816. *S. setigera* Presl, Rel. Haenk. 1: 226. 1830. *S. trochlearis* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 19. 1841.

Erect or geniculate, slender or rather stout, 1 meter high or less, cespitose; blades long and narrow, flat or loosely involute; panicles narrow, rather loose, commonly purplish, 10–30 cm. long.

Arequipa: Arequipa, *Meyen,* type of *S. trochlearis.*—Cuzco: Cuzco, *Hitchcock 22483.*—Junín: Chinche, 3,450 meters, open slope, *1283.*—Lima: Matucana, 2,400 meters, ditch bank, *378.* Chile and Argentina to Mexico.

Stipa nardoides (Philippi) Hack. ex Hitchc. Contr. U. S. Nat. Herb. 24: 271. 1925. *Danthonia nardoides* Philippi, Anal. Mus. Nac. Chile Bot. 8: 84. 1891. *S. pachypus* Pilger, Bot. Jahrb. 56: Beibl. 123: 25. 1920.

Plants very densely cespitose, 20–40 cm. high; blades short and stiff, involute, crowded, forming cushions; panicles narrow, pale green or purple, 5–10 cm. long, rather loosely flowered.

Arequipa: Mollendo, in rocks on hill slopes, *Hitchcock 22350.* Bolivia and Chile.

Stipa Neesiana Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5, pt. 1: 27. 1842.

Similar to *S. mucronata*, but with longer awns; lemmas longer, pubescent only on the lower part.

Cuzco: Cuzco, *Hitchcock 22502.* Ecuador to Argentina and Chile.

Stipa obtusa (Nees & Mey.) Hitchc. Contr. U. S. Nat. Herb. 24: 284. 1925. *Helopus obtusus* Steud. Nom. Bot. ed. 2. 1: 747. 1840, nomen. *Piptatherum obtusum* Nees & Mey. Nov. Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 181. 1841. *Urachne obtusa* Trin. & Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 5, pt. 1: 22. 1842. *Oryzopsis Neesii* Pilger, Bot. Jahrb. 56: 26. 1920.

Plants densely cespitose, 20–40 cm. high; blades numerous, erect, stiff, slender, involute, sometimes almost as long as the culms; panicles narrow, 5–15 cm. long, the branches appressed; glumes obtuse, 3 mm. long.

Cuzco: La Raya, *Pennell 13522.*—Puno: Araranca, *Pennell 13475.*—Arequipa: Arequipa, *Meyen* in 1831, type. Also in Bolivia.

Stipa peruviana Hitchc. Contr. U. S. Nat. Herb. 24: 285. 1925. *S. Lechleriana* Steud. ex. Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Panicle narrow, with appressed branches, the axils and pedicels puberulous; glumes somewhat unequal, 4–5 mm. long; awn 1–2 cm. long.

Puno: Azángaro, *Lechler 1735*, type.

Stipa plumosa Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 2, pt. 1: 37. 1836.

A somewhat woody, straggling perennial 1–2 meters long, the base loose, wiry, knotted, and almost leafless; blades elongate,

loosely involute; panicles narrow, loose, feathery, green, 10–20 cm. long; awn curved or flexuous, plumose, 2–4 cm. long.

Apurímac: Without locality, 2,600 meters, *Weberbauer 5848.*—Cuzco: Ollantaitambo, *Hitchcock 22557.*—Lima: Matucana, 2,400 meters, shale rock slope, *137.* Argentina and Chile.

Stipa rigidiseta (Pilger) Hitchc. Contr. U. S. Nat. Herb. 24: 285. 1925. *Oryzopsis rigidiseta* Pilger, Bot. Jahrb. 56: Beibl. 123: 26. 1920.

Similar to *S. obtusa;* glumes acute, 5 mm. long; fruit shorter, 3 mm. long; awns scabrous rather than scabrous-pubescent.

Puno: Azángaro, *Weberbauer 475,* type.

Stipa Smithii Hitchc. Journ. Wash. Acad. Sci. 20: 382. 1930.

A densely cespitose perennial, erect, about 60 cm. high; blades erect, rather loosely involute, glabrous, rather rigid; panicle narrow but scarcely spike-like, 10–18 cm. long, interrupted below; glumes equal, 6 mm. long; awn early deciduous, twice geniculate, scabrous, 14 mm. long.

Lima: Río Blanco, 3,000–3,500 meters, open hillsides, *Killip & Smith 30699,* type.

48. ARISTIDA L.

Annuals or perennials, the blades narrow and often convolute, the panicles narrow or open; spikelets 1-flowered, the rachilla disjointing obliquely above the glumes; glumes narrow, acute or acuminate or awn-tipped; lemma narrow, indurate, terete, convolute, with a hard, sharp-pointed, usually minutely bearded callus at the base, terminating above in a commonly trifid awn.

Plants annual.

Fruit 8 mm. long; awns not united into a column, 10–15 mm. long. *A. adscensionis.*

Fruit 2–3 mm. long; awns united at the base into a column, 5 mm. long..... *A. capillacea.*

Plants perennial.

Awns not contorted at the base..... *A. enodis.*

Awns contorted at the base.

Awns equal, 10–15 mm. long..... *A. setifolia.*

Awns unequal, 15–20 mm. long..... *A. torta.*

Aristida adscensionis L. Sp. Pl. 82. 1753. *A. bromoides* HBK. Nov. Gen. & Sp. 1: 122. 1816.

Plants tufted, glabrous, the slender wiry stems erect or ascending, branched from the lower nodes, commonly 30–40 cm. high; blades usually involute, elongate; panicles nodding or erect, commonly 10–15 cm. long, the slender branches erect or spreading and flexuous; spikelets short-pediceled, mostly clustered, the equal awns 12–20 mm. long.

Arequipa: Cotahuasi, 2,600 meters, *Weberbauer 6867*. Tingo, 2,200 meters, open rocky places, *Pennell 13137*.—Cuzco: Ollantaitambo, *Hitchcock 22553*.—Huancavelica: Río San Bernardo, 1,300 meters, *Weberbauer 6562*.—Huánuco: Huánuco, on disintegrating rock outcrop or in abandoned fields, *3513*, *3511*. Ambo, steep stony hillside, 2,100 meters, *3177*.—Ica: Pámpano, above Pisco, 1,200 meters, *Weberbauer 5380*.—Junín: Near Huancayo, 3,300 meters, open rocky hillside, *Killip & Smith 22024*.—Lima: Chosica, 900 meters, *543*. San Bartolomé, 1,500 meters, *Weberbauer 5286*. Matucana, 2,400 meters, *342*, *220*.—Moquehua: Torata, 2,200 meters, *Weberbauer 7410*.—Piura: Between Morropón and Salitral, 150 meters, *Weberbauer 5963*. Pariñas Valley, probably the most abundant annual grass of northwestern Peru, *Haught F171*. Between Piura and Nomala, 100–250 meters, *Weberbauer 5938*.—Without locality: *Weberbauer 5517*. Widely distributed in the warmer parts of both hemispheres.

Aristida capillacea Lam. Tabl. Encycl. 1: 156. 1791.

Plants very slender and delicate, 20 cm. high or less, with filiform blades; panicles open, rarely more than 7 cm. long, purplish, the branches capillary; glumes 2.5 and 3 mm. long; lemma 2 mm. long, extended into a slender twisted column 2 mm. long.

Ayacucho: Pampalca, 3,200 meters, open hillside, *Killip & Smith 22216*. Bolivia and Brazil to Mexico.

Aristida enodis Hack. Repert. Sp. Nov. 11: 21. 1912. *A. antoniana* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants erect, densely cespitose, 10–50 cm. high; blades numerous, forming dense tufts; panicles dense and spike-like, purplish, 3–8 cm. long; glumes equal, mucronate, 1 cm. long; lemma 1 cm. long, with a short, slightly twisted summit; awns spreading, 1–1.5 cm. long, the lateral ones slightly shorter.

Junín: La Oroya, 3,600 meters, stony flat above river, *983*. Yanahuanca, rocky slope, 3,000 meters, *1254*.—Puno: Type of *A. antoniana* from Azángaro, *Lechler 1774*. Also in Bolivia.

Aristida setifolia HBK. Nov. Gen. & Sp. 1: 122. 1816. *A. tarapotana* Mez, Repert. Sp. Nov. 17: 151. 1921.

Plants cespitose, erect or spreading, 10–30 cm. high or more; blades short, involute, sharp-pointed; panicles loose, narrow, 10–15 cm. long; glumes somewhat unequal; lemma 6 mm. long, the awn spirally contorted at the base.

Piura: Paita, *Safford 14.*—San Martín: Tarapoto, *Spruce 4526.* Ranging to Brazil and Colombia.

Hitchcock (Contr. U. S. Nat. Herb. 24: 405. 1927) states that the Spruce collection, which may be the type of *A. tarapotana*, perhaps represents a distinct species, the awns being longer than is usual in *A. setifolia.*

Aristida torta (Nees) Kunth, Enum. Pl. 1: 190. 1833. *Chaetaria torta* Nees, Agrost. Bras. 386. 1829.

Plants erect, slender, 1 meter high or less; blades flat or involute, 1–3 mm. wide; panicle narrow and rather lax, 8–15 cm. long, purple; glumes subequal, 6 mm. long; lemma 5 mm. long, with a straight beak 1 mm. long; lateral awns half as long as the central one, somewhat divergent.

San Martín: San Roque, abundant, *Williams 7765.* Brazil to Costa Rica.

49. NAZIA Adans.

Low annuals; blades flat; inflorescence terminal, spike-like, the burs or spikes densely crowded along a long slender axis; spikelets 1-flowered, in small spikes of 2–5, the spikes subsessile, falling entire, the spikelets sessile on a short zigzag rachis; first glumes small and thin or wanting, appressed to the rachis, the second glumes of the 2 lower spikelets strongly convex, with 3 nerves bearing a row of stout hooked prickles along each side, the 2 second glumes forming the halves of a small bur; upper 1–3 spikelets reduced and sterile; lemmas and palea thin, the lemma flat, the palea strongly convex.

Nazia aliena (Spreng.) Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 17: 28. 1899. *Lappago aliena* Spreng. Neue Entd. 3: 15. 1822.

Plants spreading, the branches mostly 20 cm. long or less; blades ciliate, commonly 2–3 mm. wide; inflorescences 2–4 cm. long, 4–5 mm. thick.

Lima: Matucana, steep rocky slopes, 2,400 meters, *343.*—Ica: Between Río de la Tranca and Yasca, *Hrdlicka* in 1913.—Arequipa:

Mollendo, sandy hills, not common, *Hitchcock 22352*. Tingo, open rocky slope, 2,200 meters, *Pennell 13129*.—Tumbez: Zorritos, 100 meters, *Weberbauer 7744*. Ranging from Argentina to the southwestern United States, and in Asia and Africa.

This small grass may be recognized easily by its spike-like inflorescence and very small, bur-like spikes. It grows usually in dry or desert regions.

50. ANTHEPHORA Schreb.

Coarse plants with flat blades; spikelets in clusters of 4, the indurate first glumes united at the base and forming a pitcher-shaped pseudo-involucre, the clusters subsessile and erect on a slender flexuous axis; glumes rigid, acute or produced into a short awn.

Anthephora hermaphrodita (L.) Kuntze, Rev. Gen. 2: 759. 1891. *Tripsacum hermaphroditum* L. Syst. Nat. ed. 10. 2: 1261. 1759. *Anthephora elegans* Schreb. Beschr. Gräs. 2: 105. *pl. 44*. 1810.

A stout annual, ascending or decumbent, branched, sometimes a meter high; blades thin, 5–13 mm. wide, often pilose like the sheaths; spikes erect, 5–10 cm. long; glumes pale, 5–7 mm. long.

Piura: Eleven miles east of Cabo Blanco, *Haught F167*. Between Piura and Lomala, 100–250 meters, *Weberbauer 5950*.—San Martín: San Roque, 1,400 meters, *Williams 7302*.—Tumbes: Plains southeast of Hacienda La Choza, 100–200 meters, *Weberbauer 7708*. Generally distributed in tropical America.

This is one of the common weedy grasses in many parts of the tropical lowlands of America. Williams reports the vernacular name as "arroz quina."

51. AEGOPOGON H. & B.

Slender low much-branched annuals; spikelets short-pedicellate, in clusters of 2–3, the clusters short-pedunculate, spreading, arranged in one-sided spike-like inflorescences; peduncle disarticulating from the axis and forming a pointed stipe below the cluster, this falling entire; central spikelet fertile, the others on longer pedicels and staminate or neuter; glumes membranaceous, notched at the apex, the midnerve extended as a point or awn; lemma and palea thinner than the glumes, extending beyond them, the lemma 3-nerved, the central nerve and sometimes also the lateral ones produced as awns, the palea 2-awned.

Spikelets in clusters of 2.....*A. bryophilus.*
Spikelets in clusters of 3.....*A. cenchroides.*

Aegopogon bryophilus Doell in Mart. Fl. Bras. 2, pt. 3: 239. 1880.

A low delicate annual, commonly 10–25 cm. high; blades short, 1 mm. wide, glabrous or nearly so; inflorescences mostly 2–4 cm. long.

Lima: Matucana, in crevices of moist rocky slope, 2,400 meters, *186*. Ranging to Brazil and Argentina.

Probably only a form or variety of *A. cenchroides*, and exactly like that species in general appearance.

Aegopogon cenchroides H. & B. ex Willd. Sp. Pl. 4: 899. 1806. *A. pusillus* Beauv. Ess. Agrost. 122. *pl. 22, f. 4*. 1812. *A. submuticus* Rupr. Mém. Acad. St. Pétersb. VI. Sci. Nat. 4, pt. 1: 25. 1840.

Plants spreading and much branched, the blades 2–4 cm. long, 1–2 mm. wide; racemes mostly 2–3 cm. long, the spikelets green or purplish.

Cuzco: Ollantaitambo, *Cook & Gilbert 699*. Cuzco, *Hitchcock 22465*.—Huánuco: Open grassy bank, 15 miles southeast of Huánuco, 3,150 meters, *2118*.—Junín: Carpapata, above Huacapistana, 2,700–3,200 meters, *Killip & Smith 24398*. Tarma, *Hitchcock 22155*.—Lima: In thickets, Mito, 2,700 meters, *1427*. Distributed from Bolivia to Mexico.

The plant has the general aspect of a small *Bouteloua*.

52. LEPTOCHLOA Beauv.

Annuals or perennials; blades flat; racemes numerous, scattered along a common axis and forming a long or short panicle; spikelets 2–several-flowered, sessile or short-pediceled, approximate or rather distant along one side of a slender rachis; rachilla disarticulating above the glumes and between the florets; glumes unequal or subequal, awnless or mucronate, 1-nerved, usually shorter than the first lemma; lemmas obtuse or acute, sometimes short-awned between the teeth, 3-nerved.

Plants annual; spikelets not awned.

Sheaths, at least the upper ones, papillose-hispid.....*L. filiformis*.

Sheaths glabrous or merely scabrous.

Sheaths minutely scabrous; racemes distinctly one-sided; lemma narrowed at the apex.....*L. scabra*.

Sheaths glabrous or nearly so; racemes indistinctly one-sided; lemmas broad and dentate at the apex.....*L. uninervia*.

Plants perennial; spikelets awned or awnless.

Lemmas awnless or nearly so; plants glabrous and glaucous. *L. virgata.*

Lemmas awned; sheaths and blades sparsely pilose, not glaucous. *L. domingensis.*

Leptochloa domingensis (Jacq.) Trin. Fund. Agrost. 133. 1820. *Cynosurus domingensis* Jacq. Misc. Austr. 2: 363. 1781.

Culms tufted, tall and slender, sparingly branched; blades flat, 1 cm. wide; racemes slender, about 5 cm. long, very numerous, ascending.

Junín: Chanchamayo Valley, *Schunke 241.* Colonia Perené, *Hitchcock 22100, 22078.*—San Martín: In pasture, Tarapoto, *Williams 5778.* Generally distributed in tropical America.

Leptochloa filiformis (Lam.) Beauv. Ess. Agrost. 71, 166. 1812. *Festuca filiformis* Lam. Tabl. Encycl. 1: 191. 1791.

Culms slender, geniculate below, ascending or erect, 1 meter tall or less; blades thin and flat, 1–1.5 cm. wide; racemes almost filiform, very numerous, spreading or ascending, mostly 8–13 cm. long, green or purplish.

Loreto: Huallaga, Yurimaguas, edge of forest or abandoned fields, *Williams 4645, 4646, 4643.* Widely distributed in tropical America. "Nudillo."

Leptochloa scabra Nees, Agrost. Bras. 435. 1829.

Plants tall and rather stout, 1 meter high or less; blades flat, 1–1.5 cm. wide; panicles 25–40 cm. long, green or purplish, the racemes very numerous, somewhat flexuous, 3–8 cm. long.

Loreto: Leticia, moist stream bank, *Williams 3066.* Generally distributed in tropical America.

Leptochloa uninervia (Presl) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 383. 1917. *Megastachya uninervia* Presl, Rel. Haenk. 1: 283. 1830. *Festuca glycerioides* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants rather stout, the numerous culms erect or decumbent at the base, 1 meter high or less; panicles narrow, 7–20 cm. long, the racemes rather few, ascending or finally spreading, 2–7 cm. long or more, lead-colored.

Huánuco: Huánuco, a weed in garden, 2,100 meters, *2443.*—Lima: Lima, *Wilkes Exped.*—Piura: Pariñas Valley, in shallow water,

a common grass after heavy rains, *Haught F5.*—Tacna: Tacna, *Lechler 1574.* General in tropical America.

Leptochloa virgata (L.) Beauv. Ess. Agrost. 166. 1812. *Cynosurus virgatus* L. Syst. Nat. ed. 10. 2: 87. 1759.

Culms in small tufts, slender and wiry, as much as 1 meter high; blades flat, 1–1.5 cm. wide; racemes slender, commonly 8–10 cm. long, ascending, very numerous, purplish.

Loreto: Edge of chácara, La Victoria, *Williams 2892.* Paraíso, Alto Itaya, *Williams 3221.* General in tropical America.

53. TRICHONEURA Anderss.

Slender annuals or perennials with elongate narrow flat blades; panicles open or narrow, composed of numerous racemose spikes; spikelets several-flowered, short-pedicellate; glumes narrow, subequal, 1-nerved; lemmas obtuse.

Trichoneura Weberbaueri Pilger, Bot. Jahrb. 50: Beibl. 111: 1. 1913.

Plants 20–30 cm. high, annual, branched from the base; blades linear, flat, 3 cm. long or less, scaberulous and sparsely hirsute; panicles spike-like, 2–4 cm. long, 1–1.5 cm. broad; spikelets compressed, 6 mm. long; glumes 4.5–6 mm. long.

Lima: Mountains north of Chosica, 1,400 meters, *Weberbauer 5345,* type collection.

54. GOUINIA Fourn.

Erect perennials; spikelets few-flowered, short-pediceled, appressed, in long slender racemes, these racemosely arranged; glumes and lemmas keeled, the lemmas densely villous on the nerves, awned, the uppermost much reduced but awned.

Gouinia virgata (Presl) Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 4: 10. 1897. *Bromus virgatus* Presl, Rel. Haenk. 1: 263. 1830.

A wiry perennial about 1 meter high; blades flat, elongate; panicles large and open, composed of 5–8 distant spreading racemes 15 cm. long or less, these floriferous to the base; spikelets appressed and more or less imbricate.

Huánuco: Type from mountains of Huánuco, *Haenke.* Bolivia and Brazil to Mexico.

55. TRIPOGON R. & S.

Low tufted perennials with narrow blades; spikelets several–many-flowered, sessile, erect, arranged in a single simple spike; glumes shorter than the lowest floret; lemmas awned between the lobes of the minutely 2-lobed apex.

Tripogon spicatus (Nees) Ekman, Ark. Bot. 11, No. 4: 36. 1912. *Bromus spicatus* Nees, Agrost. Bras. 471. 1829.

Plants densely cespitose, the slender erect culms 15 cm. high or less; leaves almost filiform, clustered at the base; spikes dark lead-colored.

Lima: Matucana, 2,400 meters, hard soil on rock outcrop, *329*. San Bartolomé, 1,500 meters, *Weberbauer 5311*. Ranging to Brazil and Argentina; also in Mexico and Texas.

56. ELEUSINE Gaertn. Goose grass

Annuals; flower spikes 2–several at the summit of the culm, and sometimes 1–2 a short distance below, stout, digitate; spikelets few–several-flowered, compressed, sessile, closely imbricate in 2 rows along one side of a broad rachis; glumes unequal, broad, acute, 1-nerved, shorter than the first lemma; lemmas acute, with 3 green nerves close together and forming a keel.

Eleusine indica (L.) Gaertn. Fruct. & Sem. 1: 8. 1788. *Cynosurus indicus* L. Sp. Pl. 72. 1753.

Plants erect or spreading, usually 30–60 cm. high, often much branched from the base; blades flat, linear, 1.5–3 mm. wide; spikes 2–several, mostly 2–10 cm. long and 4–5 mm. wide.

Junín: La Merced, sandy stream bed, 600 meters, *5230*. Chanchamayo Valley, *Schunke 238*.—Loreto: Open places, Leticia, *Williams 3067*. A native of the Old World, but widely naturalized in America; one of the most plentiful weedy grasses of tropical American lowlands.

57. DACTYLOCTENIUM Willd.

Annuals or perennials with flat blades; flowers in 2–several short thick spikes digitate and widely spreading at the summit of the culm; spikelets 3–5-flowered, compressed, sessile, closely imbricate in 2 rows along one side of the rather narrow rachis; rachilla disarticulating above the first glume and between the florets; glumes somewhat unequal, broad, 1-nerved, the second mucronate or short-

awned below the tip, deciduous; lemmas firm, broad, keeled, 3-nerved, acuminate or short-awned; palea about as long as the lemma.

Dactyloctenium aegyptium (L.) Richt. Pl. Eur. 1: 68. 1870. *Cynosurus aegyptius* L. Sp. Pl. 72. 1753.

Plants erect or spreading, with stolons, more or less pilose, annual, often much branched from the base and forming dense mats; blades flat and commonly short, 3–5 mm. wide; spikes 2–4, mostly 1.5–2.5 cm. long and 5 mm. thick.

Loreto: Yurimaguas, *Williams 4022.*—Piura: Pariñas Valley, *Haught 117.* Negritos, *Haught F4.*—San Martín: Morales, Tarapoto, in pasture, *Williams 5685.* Native of the Old World, but generally naturalized in tropical America; one of the common weedy grasses of tropical lowlands.

58. CYNODON L. Rich. Bermuda grass

Low perennials with creeping stolons or rhizomes; flowers in several digitate slender spikes at the summit of the erect flowering stems; spikelets 1-flowered, awnless, sessile in 2 rows along one side of a slender rachis; rachilla disarticulating above the glumes and prolonged behind the palea as a slender naked bristle; glumes narrow, subequal, acuminate, 1-nerved; lemma strongly compressed, pubescent on the keel, 3-nerved.

Cynodon Dactylon (L.) Pers. Syn. Pl. 1: 85. 1805. *Panicum Dactylon* L. Sp. Pl. 58. 1753. *C. maritimus* HBK. Nov. Gen. & Sp. 1: 170. 1816. *Digitaria maritima* Spreng. Syst. Veg. 1: 272. 1825. *Cynodon erectus* Presl, Rel. Haenk. 1: 190. 1830. *Capriola Dactylon* Kuntze, Rev. Gen. 2: 764. 1891. *Cynodon Dactylon* var. *maritimus* Hack. in Fries, Ark. Bot. 8: 40. 1909. *Capriola Dactylon* var. *maritima* Hitchc. U. S. Dept. Agr. Bull. 772: 179. 1920.

A widely creeping perennial, often forming large close mats, the culms compressed and wiry; blades very narrow and short; spikes 3–5, spreading, slender, about 3 cm. long.

Lima: Chosica, on moist banks, 900 meters, *524.* Lima, *Hitchcock 22243.* Native of the Old World, but naturalized widely in America.

Bermuda grass is one of the abundant weeds in most parts of tropical America. In some regions it is planted as a lawn grass, and in the tropics it is well adapted to such use. It is planted sometimes also for pasture. In cultivated ground it is one of the most troublesome of weeds, because it is all but impossible to eradicate it.

Cynodon maritimus and *C. erectus* were based upon Peruvian material. The former is a robust form with stout and coarse branches.

59. MICHROCHLOA R. Br.

Low tufted annuals with long and narrow blades; spikelets arranged in long, slender, simple, strongly curved spikes, 1-flowered, without awns.

Microchloa indica (L. f.) Kuntze, Rev. Gen. 3, pt. 2: 356. 1898. *Nardus indicus* L. f. Suppl. Pl. 105. 1781.

Plants 15 cm. high or less, forming very dense, small clumps; blades narrow, flat or folded, shorter than the spikes, glabrous; spikes solitary, green or purplish, 10 cm. long or less.

Lima: Matucana, dry hard soil, 2,400 meters, *448*. Colombia to Argentina, and in the Old World tropics.

60. GYMNOPOGON Beauv.

Annuals or perennials with flat blades; spikes numerous, slender, alternate or digitate; spikelets 1-flowered, almost sessile, the rachilla extended and bearing a small scale, this usually awned; glumes unequal, narrow, acute; fertile lemma 3-nerved, awned.

Gymnopogon foliosus (Willd.) Nees, Agrost, Bras. 426. 1829. *Chloris foliosa* Willd. Sp. Pl. 4: 924. 1806.

Plants annual or perennial, branched near the base or tufted, 20–40 cm. high, erect, slender, glabrous; sheaths with a row of long hairs at the mouth, the blades tapering, 1–2.5 cm. long, 1–2 mm. wide; spikes 4–8, digitate, 2–4.5 cm. long.

San Martín: Lamas, 840 meters, *Williams 6461*. Ranging to the West Indies.

61. CHLORIS Sw.

Annuals or tufted perennials, with flat blades; spikes one-sided, slender, clustered at the summit of the culm; spikelets with 1 perfect floret, sessile in 2 rows along one side of a continuous rachis, the rachilla disjointing above the glumes, produced beyond the perfect floret and bearing 1–several reduced florets consisting of empty lemmas, these often truncate; glumes more or less unequal, the first shorter, acute; lemma keeled, usually broad, 1–5-nerved, awned between the teeth of the bifid apex, the sterile lemmas awned or awnless.

Lemmas not awned. Spikes dark brown.....*C. distichophylla.*

Lemmas awned; spikes pale or purple.

Sterile floret broadest at the summit, truncate.

Plants perennial; spikes flexuous.....*C. polydactyla.*

Plants annual; spikes straight.....*C. virgata.*

Sterile floret narrow, acute or acutish.

Plants perennial, with stolons; spikes finally spreading or reflexed.....*C. Beyrichiana.*

Plants annual, without stolons; spikes erect or ascending. *C. radiata.*

Chloris Beyrichiana Kunth, Rév. Gram. 1: 89, 289. 1829; *pl. 56.* 1830.

Plants producing elongate leafy stolons; flowering culms erect, 20–40 cm. high; blades short, flat or folded, obtuse; spikes 6–10, purplish, 5–8 cm. long, very slender, arranged in 1–2 whorls.

Cuzco: Cuzco, *Hitchcock 22492.* Ollantaitambo, *Hitchcock 22552.*—Huánuco: Mito, stony western slopes, 2,700 meters, *3331.* Ecuador to Brazil and Argentina.

Chloris distichophylla Lag. Gen. & Sp. Nov. 4. 1816. *?C. paytensis* Steud. Syn. Pl. Glum. 1: 207. 1854.

Perennial, erect, rather stout, 1 meter high or less; sheaths compressed and keeled; blades short, flat, obtuse, 1 cm. wide or less; spikes numerous, flexuous, 7–14 cm. long.

Cuzco: Santa Ana, *Cook & Gilbert 1532, 1576.*—San Martín: Tarapoto, *Spruce 4911.* Extending to Brazil and Argentina.

Chloris paytensis was based on material from Paita, Peru.

Chloris polydactyla (L.) Sw. Prodr. Veg. Ind. Occ. 26. 1788. *Andropogon polydactylon* L. Sp. Pl. ed. 2. 1483. 1763.

Plants slender, erect, sometimes more than 1 meter high, the sheaths scarcely compressed or keeled; blades flat, long-acuminate, much elongate, up to 1 cm. wide; spikes very silky, 20 or fewer, pale or purplish, commonly 8–15 cm. long.

San Martín: Tarapoto, *Williams 5650, 5747.* Widely distributed in tropical America.

Chloris radiata (L.) Sw. Prodr. Veg. Ind. Occ. 26. 1788. *Agrostis radiata* L. Syst. Nat. ed. 10. 2: 879. 1759.

Plants decumbent or ascending, much branched from the base, commonly 60 cm. high or less; sheaths broad and compressed; blades thin, flat or folded, scaberulous or sparsely pilose, acute; spikes many, greenish or purplish, flexuous, mostly 4–8 cm. long.

Junín: Chanchamayo Valley, *Schunke 239*.—Lima: Chosica, in old banana plantation, 900 meters, *552*. Lima, *Hitchcock 22345*.—Piura: Piura, *Spruce 6438*.—San Martín: San Roque, edge of path, 1,400 meters, *Williams 7125*. General in tropical America.

Chloris virgata Sw. Fl. Ind. Occ. 1: 203. 1797. *C. pubescens* Lag. Var. Cienc. 2, pt. 4: 143. 1805. *C. elegans* HBK. Nov. Gen. & Sp. 1: 166. *pl. 47*. 1816.

Culms ascending, 20–60 cm. high, scarcely compressed; upper sheaths somewhat inflated, glabrous in the throat; blades elongate, attenuate, mostly 2–3 mm. wide, pilose or nearly glabrous; spikes usually 5–6, suberect, 3–5 cm. long, pale or purplish; fertile lemma villous on the keel below the summit.

Lima: Matucana, dry hard soil on northern slope, 2,400 meters, *222*. San Bartolomé, 1,500 meters, *Weberbauer 5287*.—Piura: Between Morropón and Salitral, 150 meters, *Weberbauer 5964*. Argentina to the West Indies.

Chloris pubescens was described from Peru.

62. TRICHLORIS Fourn.

Perennials with slender erect culms and narrow flat blades; spikes several, clustered at the top of the culm, one-sided, feathery because of the numerous conspicuous long awns; spikelets 2–5-flowered, similar to those of *Chloris;* fertile lemma 3-awned, the lateral awns sometimes reduced.

Trichloris pluriflora Fourn. Mex. Pl. 2: 142. 1886.

Plants tufted, 1 meter high or less; blades elongate, nearly 1 cm. wide, glabrous or nearly so; spikes several, brownish, 5–10 cm. long, 3–5-flowered; lateral awns of the lemmas somewhat reduced, sometimes wanting.

Huancavelica: Río San Bernardo, 1,400 meters, *Weberbauer 6577*. Argentina to the southern United States.

In general appearance the plant resembles a species of *Chloris*.

63. BOUTELOUA Lag.

Annuals or perennials; spikes short or elongate, racemose or sometimes solitary, the spikelets few to many in each spike, rarely

solitary, pectinate or loosely arranged and appressed, the rachis of the spike commonly produced beyond the insertion of the spikelets; spikelets 1-flowered, with rudiments of 1 or more flowers above, sessile in 2 rows along one side of the rachis; glumes unequal, 1-nerved, acuminate or awned; lemma 3-nerved, the nerves extending into short or long awns; palea 2-nerved, sometimes 2-awned.

Spike only one, the florets falling separately. A small annual. *B. simplex.*

Spikes few to many, falling entire.

Plants perennial..... *B. curtipendula.*

Plants annual.

Rachis with a sharp, densely bearded point at the base. *B. aristidoides.*

Rachis not sharp-pointed at the base.

Spikes 5–20, almost 1 cm. long, excluding the awns, these about as long as the spikelet..... *B. disticha.*

Spikes usually more than 20, about 5 mm. long, the awns commonly less than 5 mm. long and sometimes very short..... *B. pilosa.*

Bouteloua aristidoides (HBK.) Griseb. Fl. Brit. W. Ind. 537. 1864. *Dinebra aristidoides* HBK. Nov. Gen. & Sp. 1: 171. 1816. *D. hirsuta* Presl, Rel. Haenk. 1: 292. 1830. *Eutriana hirsuta,* Kunth, Rév. Gram. 1: Suppl. 23. 1830.

Plants slender, 10–20 cm. high, much branched from the base, the short blades about 1 mm. wide; spikes numerous, very slender, 1 cm. long, pale green.

Piura: Between Piura and Nomala, 100–250 meters, *Weberbauer 5939.* Argentina to the southern United States.

Dinebra hirsuta was described from Peru, where it was collected by Haenke.

Bouteloua curtipendula (Michx.) Torr. in Emory, Mil. Reconn. 154. 1848. *Chloris curtipendula* Michx. Fl. Bor. Amer. 1: 59. 1803.

Plants slender, erect, tufted, 1 meter high or less; blades flat, 3–5 mm. wide, pale; spikes 1–1.5 cm. long, pale, very numerous, arranged on an axis 10–20 cm. long or more; awns short and inconspicuous.

Huancavelica: Mantaro Valley, 2,800 meters, *Weberbauer 7615.*—Huánuco: Ambo, among agaves, 2,100 meters, *3170.*—Puno: Calacoto,

Jelski 589.—Without locality, *Weberbauer 6440.* Argentina to Canada.

Bouteloua disticha (HBK.) Benth. Journ. Linn. Soc. Bot. 19: 105. 1881. *Polyodon distichum* HBK. Nov. Gen. & Sp. 1: 175. *pl. 55.* 1816. *B. piurensis* Pilger, Repert. Sp. Nov. 17: 447. 1921.

Plants slender, spreading or erect, the culms sometimes decumbent and 60 cm. long; blades flat, bright green, pilose on the margins and upper surface, mostly 3–4 mm. wide; spikes green, spreading or reflexed; spikelets usually 3–6.

Piura: Between Morropón and Salitral, 150 meters, *Weberbauer 5961,* type collection of *B. piurensis.* Cabo Blanco, abundant, *Haught F52.*—Tumbes: Cancas, 100 meters, *Weberbauer 7756.* Mancora Valley, *Haught 148.* Ranging to the West Indies.

Bouteloua pilosa (Hook. f.) Benth. ex Wats. Proc. Amer. Acad. 18: 179. 1883. *Eutriana pilosa* Hook. f. Trans. Linn. Soc. 20: 173. 1851.

Similar to *B. disticha,* but differing in the more numerous and smaller spikelets, with shorter awns.

San Martín: Tarapoto, *Spruce 4445.* Extending to Guatemala.

According to Hitchcock, this probably is only a form of *B. disticha.*

Bouteloua simplex Lag. Var. Cienc. 2, pt. 4: 141. 1805.

A spreading annual, often much branched from the base, the slender culms decumbent, 10–20 cm. long, or sometimes only 2–3 cm. long; blades short, about 1 mm. wide; spike more or less curved, stout, purplish or pale, 1–3 cm. long.

Arequipa: Cotahuasi, 2,600 meters, *Weberbauer 6868.* Tingo, open rocky slopes, 2,200 meters, *Pennell 13135.*—Cuzco: Cuzco, 3,600 meters, *Herrera 2395.*—Huánuco: Huánuco, stony slope, 2,100 meters, *3241.*—Junín: Huancayo, open rocky hillside, 3,400 meters, *Killip & Smith 22025.*—Lima: Matucana, rocky hillside, 2,400 meters, *219.*—Moquehua: Torata, 2,200 meters, *Weberbauer 7413.*—Puno: Chuquibambilla, rocky clay slope, 4,000 meters, *Pennell 13376.* Ecuador to Argentina; originally described from Peru.

64. MUNROA Torr.

Small annuals; spikelets in pairs or 3's on a short rachis, the lower 1–2 larger, 3–4-flowered, the upper 2–3-flowered, the group enclosed

in the broad sheaths of short leaves, usually about 3 in a fascicle, forming a cluster or head at the ends of the branches; rachilla disjointing above the glumes and between the florets; glumes of the lower spikelets equal, 1-nerved, acute; lemmas 3-nerved, those of the lower spikelet coriaceous, acuminate, the points spreading.

Munroa decumbens Philippi, Anal. Mus. Nac. Chile Bot. 8: 90. 1891.

A low spreading annual, about 5 cm. high or less, branched; leaves fascicled, the blades short, flat, sharp-pointed; spikelets rather soft, pale green; lemmas 2 mm. long.

Arequipa: Arequipa, open gravelly soil, 2,500 meters, *Pennell 13182*. Also in Bolivia and Chile.

65. PHALARIS L.

Annuals or perennials with spike-like panicles; spikelets strongly compressed; glumes keeled, exceeding the subindurate perfect floret and the attached sterile lemmas.

Phalaris minor Retz. Obs. Bot. 3: 8. 1783.

An erect annual; blades flat, elongate; spikelets arranged in oblong heads 3–4 cm. long and 1 cm. thick; florets 5 mm. long.

Lima: Lima, *Hitchcock 22346*. Native of the Old World, occasionally naturalized in America.

Phalaris canariensis L., canary grass or *alpiste*, is said to be cultivated in the Department of Cuzco.

66. ORYZA L. Rice

Coarse annuals or perennials; blades flat, much elongate; spikelets in open panicles, 1-flowered, laterally compressed, disjointing below the glumes; glumes 2, much shorter than the lemma, narrow; lemma rigid, keeled, 3-nerved, often awned.

Plants perennial, native; blades usually 4–5 cm. wide. . .*O. latifolia*.
Plants annual, introduced; blades mostly 2 cm. wide or less. .*O. sativa*.

Oryza latifolia Desv. Journ. de Bot. Desv. 1: 77. 1813. *O. sativa* var. *latifolia* Doell in Mart. Fl. Bras. 2, pt. 2: 7. 1871.

A coarse perennial, often 2 meters high; blades flat, scabrous, mostly 50–60 cm. long or more; panicles large and rather open, many-flowered; spikelets with short or elongate, slender awns, short-pediceled along the upper part of the long, ascending, often flexuous branches.

Loreto: Iquitos, *Williams 8087*. Río Masana, *Williams 2*. La Victoria, edge of forest, *Williams 3093*. Brazil to the West Indies and Central America. "Gramalote."

Oryza sativa L. Sp. Pl. 333. 1753.

An erect annual, usually 1 meter high or more, with long narrow blades; panicles rather compact and narrow, many-flowered, often drooping; spikelets 7–10 mm. long; lemma ridged by the lateral nerves, more or less hispidulous, the awn several cm. long or more often wanting.

Loreto: Puerto Arturo, *Williams 5166*. Timbuchi, Río Nanay, *Williams 858*. Native of the Old World, but cultivated in most regions of tropical America. "Arroz."

The rice cultivated so generally in tropical America usually is of the upland variety, which grows in comparatively dry soil, under about the same soil conditions as wheat. Rice is one of the important food staples throughout tropical America.

67. LUZIOLA Juss.

Annuals with elongate blades, the spikelets panicled; spikelets unisexual, 1-flowered, disjointing from the pedicel, the staminate and pistillate flowers in separate panicles on the same plant; first glume and palea wanting; second glume and lemma subequal, thin, several–many-nerved, lanceolate or oblong; stamens several.

Luziola peruviana Gmel. Syst. Nat. 1: 637. 1791.

More or less decumbent and spreading, the culms 10–30 cm. long; blades flat, sometimes as much as 6 mm. wide; panicles 2–3 cm. long, spreading; pistillate spikelets 2–3 mm. long, the glumes and lemmas striate; staminate spikelets 5 mm. long.

Lima: Lima, *Seemann 866*. Bolivia and Brazil. Type collected in Peru, probably by Dombey, the exact locality not known.

68. PHARUS L.

Perennials, erect or decumbent at the base; blades broad and flat, petioled, with fine transverse veins between the longitudinal nerves, the nerves running obliquely from base to margin; panicles large and open; spikelets 1-flowered, unisexual, in pairs along the branches of the panicle, one pistillate and sessile, the other staminate and long-pediceled; pistillate spike terete, its glumes subequal, several-nerved, the lemma indurate in fruit, longer than the glumes, with a minute bent beak, the back clothed with uncinate hairs;

palea 2-nerved, as long as the lemma; staminate spikelet laterally compressed; stamens 6.

Fruit pubescent only near the apex.....*P. latifolius.*

Fruit pubescent almost all over.

Culms erect.....*P. glaber.*

Culms decumbent and rooting at the base.....*P. parvifolius.*

Pharus glaber HBK. Nov. Gen. & Sp. 1: 196. 1816. *P. glochidiatus* Presl, Rel. Haenk. 1: 345. 1830.

Plants stiffly erect, 1 meter high or less; blades oblanceolate, acuminate, mostly 15–25 cm. long and 3–7 cm. wide, glabrous; panicles very large and open, fragile, the stiff branches ascending or spreading; spikelets appressed, brown, oblong, 1 cm. long or more.

Loreto: Paraíso, Alto Itaya, *Williams 3256.* In or at the edge of forest, Puerto Arturo, 200 meters, *Williams 5230, 5285.*—Puno: Sangabán, *Lechler 2310.*—San Martín: Tarapoto, in forest, *Williams 5819.* San Roque, in forest, *Williams 7341.* General in tropical America. "Afas-quina."

The panicles of this and the other species adhere by the hooked hairs to clothing and to the bodies of passing animals. The species is a characteristic grass of wet lowland forests. *P. glochidiatus* was described from Peru.

Pharus latifolius L. Syst. Nat. ed. 10. 2: 1269. 1759.

Similar to *P. glaber;* blades commonly larger and broader; spikelets larger, often 1.5 cm. long.

Loreto: In forest, Puerto Arturo, 200 meters, *Williams 5140.* Mishuyacu, near Iquitos, 100 meters, *Klug 214.* Ranging to Brazil and the West Indies. "Paufil chaqui."

Pharus parvifolius Nash, Bull. Torrey Club 35: 301. 1908.

Distinguished by the decumbent and rooting base of the culm; leaves usually smaller and narrower than in the other species, commonly 2.5–3 cm. wide.

Loreto: Santa Rosa, 135 meters, in forest, *Killip & Smith 28891.* Bolivia to Brazil, Central America, and the West Indies.

Some of the specimens listed under *P. glaber* may belong here, but it seems impossible to separate the two species definitely unless the base of the plant is present. The character separating *P. parvifolius* appears to be one of rather doubtful importance for distinguishing a species.

69. ARUNDINELLA Raddi

Tufted perennials with narrow elongate blades; spikelets short-pediceled, arranged in large panicles; glumes acuminate, the tips spreading, the second longer than the first and the sterile lemma; fertile lemma minute, bearded on the callus, with a long slender awn from the apex.

Arundinella Berteroniana (Schult.) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 290. 1917. *Trichochloa Berteroniana* Schult. Mant. 2: 209. 1824. *Thysanachne peruviana* Presl, Rel. Haenk. 1: 253. 1830. *A. crinita* Trin. Linnaea 10: 299. 1836. *A. peruviana* Steud. Syn. Pl. Glum. 1: 115. 1854.

Plants erect, forming clumps, usually less than 1 meter high; blades linear, folded or involute, green; panicles commonly pale green, rather open, feathery.

Huánuco: Type of *T. peruviana* from mountains of Huánuco, *Haenke*. Puerto Victoria, open bank, *Killip & Smith 26824*.—Junín: La Merced, 600 meters, sandy river bank, *5357*.—Puno: Sangabán, *Lechler 2427*.—San Martín: San Roque, 1,400 meters, in forest, *Williams 7688, 7459*. Tarapoto, 750 meters, *Williams 5470*. Bolivia and Brazil to Mexico and the West Indies. Type of *Arundinella crinita* from Peru, *Poeppig*.

70. LEPTOCORYPHIUM Nees

Erect cespitose perennials with narrow blades and narrow panicles; spikelets lanceolate, 1-flowered, with a sterile lemma below; first glume obsolete; second glume and sterile lemma 3- and 5-nerved, the latter slightly longer; fertile lemma slightly cartilaginous-indurate, chestnut with a delicate white summit.

Leptocoryphium lanatum (HBK.) Nees, Agrost. Bras. 84. 1829. *Paspalum lanatum* HBK. Nov. Gen. & Sp. 1: 94. *pl. 29*. 1816.

Plants slender, 1 meter high or less, not branched; blades long and narrow, often involute; panicles loose, oblong, many-flowered, grayish, the branches capillary; spikelets silky-pilose, the hairs at first appressed but later spreading.

San Martín: Tarapoto, *Spruce 4501*. Argentina to Mexico and the West Indies.

71. TRICHACHNE Nees

Perennial grasses with long narrow blades; racemes slender, aggregate along the upper part of the axis and forming a silky panicle; spikelets in pairs, lanceolate, in 2 rows along one side of a

narrow rachis; first glume minute, glabrous; second glume and sterile lemma about as long as the fruit, 3–5-nerved, densely silky-pilose; fertile lemma cartilaginous, lanceolate, acuminate, usually brown, with broad flat white hyaline margins.

Panicles tawny, the spikelets densely pilose; sheaths usually more or less hirsute ..... *T. insularis.*

Panicles whitish, the spikelets sparsely pilose; sheaths glabrous. *T. sacchariflora.*

Trichachne insularis (L.) Nees, Agrost. Bras. 86. 1829. *Andropogon insularis* L. Syst. Nat. ed. 10. 2: 1304. 1759. *Valota insularis* Chase, Proc. Biol. Soc. Wash. 19: 188. 1906.

Plants forming dense clumps, commonly about 60 cm. high; blades flat, usually scabrous, up to 14 mm. wide; panicles densely silky, 30 cm. long or less.

San Martín: Tarapoto, in pasture, *Williams 5599.* Widely distributed in the lowlands of tropical America.

Williams reports the vernacular name as "alfalfa."

Trichachne sacchariflora (Raddi) Nees, Agrost. Bras. 87. 1829. *Acicarpa sacchariflora* Raddi, Agrost. Bras. 31. *pl. 1, f. 4.* 1823. *Panicum javanianum* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen; Doell in Mart. Fl. Bras. 2, pt. 2: 137. 1877.

Plants rather slender, tufted, 1 meter high or less; blades flat, 3–12 mm. wide, bright green; panicles mostly 10–20 cm. long, laxer than in *T. insularis,* the racemes loosely flowered.

Huancavelica: Río San Bernardo, *Weberbauer 6559.*—Junín: La Merced, 600 meters, sandy valley floor, *5451.*—Loreto: Puerto Arturo, Yurimaguas, *Williams 5104.*—Puno: Sangabán, *Lechler 2399,* type of *Panicum javanianum.*—San Martín: San Roque, 1,400 meters, *Williams 7766.* Ranging to Brazil and Argentina.

72. DIGITARIA Heist. Crabgrass

Annuals or perennials, erect or prostrate, with long narrow blades; racemes slender, digitate, or somewhat scattered but aggregate along the upper part of the culm; spikelets solitary or in 2's or 3's, subsessile or short-pediceled, alternate in 2 rows on one side of a 3-angled, winged or wingless rachis; spikelets lanceolate to elliptic, plano-convex, the first glume minute or wanting; second glume equaling or shorter than the sterile lemma; fertile lemma cartilaginous, with pale hyaline margins.

Culms erect or spreading, not creeping.....*D. violascens.*

Culms widely creeping.

Racemes very slender; rachis with scattered long white hairs; spikelets 2.5 mm. long.....*D. horizontalis.*

Racemes stouter; rachis without long hairs; spikelets 3 mm. long.....*D. sanguinalis.*

Digitaria horizontalis Willd. Enum. Pl. 92. 1809. *Milium digitatum* Sw. Prodr. Veg. Ind. Occ. 24. 1788. *Syntherisma digitata* Hitchc. Contr. U. S. Nat. Herb. 12: 142. 1908. *D. digitata* Urban, Symb. Antill. 8: 24. 1920, non Buese, 1854.

Plants annual, very slender, copiously pilose with long spreading whitish hairs; blades flat, bright green; racemes very slender, green, mostly 7–13 cm. long.

Loreto: Santa Rosa, 135 meters, *Killip & Smith 28867.* Tropical regions of both hemispheres.

Digitaria sanguinalis (L.) Scop. Fl. Carn. ed. 2. 1: 52. 1772. *Panicum sanguinale* L. Sp. Pl. 57. 1753. *Syntherisma sanguinalis* Dulac, Fl. Haut. Pyr. 77. 1867.

Plants much branched, slender; sheaths pilose, the blades pilose or glabrous, flat; racemes commonly 3–8, 10 cm. long or less, subdigitate or in fascicles along a short axis, the rachis 0.5 mm. wide.

Junín: Colonia Perené, *Hitchcock 22075.* Widely distributed in both hemispheres, perhaps introduced in America.

Digitaria violascens Link, Hort. Berol. 1: 229. 1827. *Syntherisma violascens* Nash in Brown, Proc. Acad. Phila. 61: 488. 1909.

A decumbent annual 30–80 cm. high; sheaths and blades glabrous or pubescent; racemes few to many, ascending, 4–8 cm. long; margins of the rachis much narrower than the center; spikelets 1.3–1.5 mm. long, minutely pubescent.

Junín: Colonia Perené, *Hitchcock 22090.* Tropics of both hemispheres.

73. PSEUDECHINOLAENA Stapf

Slender annuals or perennials, the culms with creeping bases, the blades broad and short, flat; spikelets arranged in lax and interrupted, erect or ascending racemes, the back of the fruit of the primary spikelet turned from the axis; first and second glumes about as long as the spikelet, the second covered with hooked spines and ventricose at maturity.—The genus consists of a single species.

Pseudechinolaena polystachya (HBK.) Stapf in Prain, Fl. Trop. Afr. 9: 495. 1919. *Echinolaena polystachya* HBK. Nov. Gen. & Sp. 1: 119. 1816.

Culms very slender, rooting at the base, the fertile ones erect or ascending, 20–50 cm. high; blades thin, lance-oblong, 3–6 cm. long, about 1 cm. wide, pilose like the sheaths; racemes 2–3 cm. long, forming a lax elongate inflorescence.

Amazonas: Chachapoyas, *Mathews 3241.*—Huánuco: Casapí *Mathews 2103.*—Junín: La Merced, wooded slope, 600 meters, *5354.* Chanchamayo Valley, 1,200 meters, *Schunke 239, 240.* Quimiri, *Schunke A44.* Dos de Mayo, 1,800 meters, *Killip & Smith 25807.*—San Martín: Tarapoto, in forest, 750 meters, *Williams 6082.* San Roque, 1,400 meters, *Williams 7485, 7020a.* Uruguay to southern Mexico.

74. ERIOCHLOA HBK.

Annuals or perennials with flat blades; panicles terminal, composed of several or many spreading or appressed racemes, these usually rather closely spaced along the main axis; spikelets dorsally compressed, pubescent, solitary or in pairs, short-pediceled or subsessile, in 2 rows on one side of a narrow and usually hairy rachis, the back of the fertile lemma turned from the rachis; lower rachilla joint thickened, forming a ring-like, usually dark-colored callus below the second glume, the first glume reduced to a minute sheath about this and adnate to it; second glume and sterile lemma subequal, acute or acuminate; fertile lemma indurate, minutely papillose-rugose, mucronate or awned.

Racemes 2 or rarely 3 ..... *E. distachya.*

Racemes several.

Racemes 1–2 cm. long, dense, rather distant; pedicels with erect hairs almost as long as the spikelets ..... *E. Weberbaueri.*

Racemes commonly more than 2 cm. long, slender, approximate; pedicels almost glabrous or with short hairs.

Spikelets 4–6 mm. long; plants perennial ..... *E. punctata.*

Spikelets 3 mm. long; plants annual.

Fruit short-awned; pedicels glabrous or nearly so. *E. ramosa.*

Fruit obtuse, not awned; pedicels conspicuously villous. *E. peruviana.*

Eriochloa distachya HBK. Nov. Gen. & Sp. 1: 95. *pl. 30.* 1816.

An erect perennial 20–40 cm. high, branched above; peduncles slender, exserted; racemes 1–2 cm. long, about 1 cm. apart, the

rachis woolly; pedicels short, with a ring of long hairs at the summit.

San Martín: Tarapoto, *Spruce 4368*. Paraguay to Guatemala.

Eriochloa peruviana Mez, Bot. Jahrb. 56: Beibl. 125: 12. 1921.

Plants very slender, erect or spreading; blades bright green, flat, narrow and elongate, glabrous; spikelets green, 3 mm. long; pedicels villous with long hairs.

Piura: Between Piura and the Hacienda Nomala, *Weberbauer 5952*, type collection. El Tablazo, northeast of Talara, *Haught F136*.

Eriochloa punctata (L.) Desv. ex Hamilt. Prodr. Ind. Occ. 5. 1825. *Milium punctatum* L. Syst. Nat. ed. 10. 2: 872. 1759.

Plants ascending from a decumbent base, perennial, branched, sometimes 1 meter high, glabrous or nearly so; blades flat, 10–15 mm. wide; racemes stout and dense, greenish, narrowly ascending.

Lima: Above San Bartolomé, 1,600 meters, *Weberbauer 5289*, Chosica, 900 meters, in neglected banana plantation, *546*.—Loreto: Iquitos, 100 meters, *Killip & Smith 27258*. Argentina to the United States.

Eriochloa ramosa (Retz.) Kuntze, Rev. Gen. Pl. 2: 775. 1891. *Milium ramosum* Retz. Obs. Bot. 6: 22. 1791.

A slender perennial, glabrous, ascending, sparingly branched; blades elongate, 2–5 mm. wide; panicles pale green, the few to several racemes erect or ascending; spikelets silky.

Lima: Lima, *Hitchcock 22339*. Callao, *Wilkes Exped.* Native of the Old World tropics, occasionally naturalized in America.

Eriochloa Weberbaueri Mez, Bot. Jahrb. 56: Beibl. 125: 11. 1921.

Plants tufted, with long prostrate culms and ascending branches, densely leafy below; racemes short and thick, mostly spreading, the pedicels bearing stiff hairs nearly as long as the paired pubescent spikelets.

Cajamarca: Santa Cruz, *Weberbauer 4135*, type.

75. AXONOPUS Beauv.

Plants perennial or annual, with the aspect of *Paspalum*, stoloniferous or tufted; blades flat or folded, abruptly rounded or pointed at the tip; racemes few or numerous, slender, spike-like, digitate or

racemose along the main axis; spikelets depressed-biconvex, oblong, usually obtuse, solitary, sessile and alternate in 2 rows along one side of a 3-angled rachis, the back of the fertile lemma turned from the axis; first glume wanting, the second glume and sterile lemma equal, the lemma without a palea; fertile lemma and palea indurate, the lemma obtuse, the margins slightly inrolled.

Rachis bearing conspicuous stiff spreading golden-yellow hairs. *A. aureus.*

Rachis without stiff hairs.

Plants annual. Racemes 2–5, delicate, short..... *A. capillaris.*

Plants perennial.

Blades folded or involute, not more than 5 mm. wide, usually stiff. Plants without stolons.

Racemes numerous, 7–10 cm. long..... *A. attenuatus.*

Racemes few, 4–6 cm. long..... *A. elegantulus.*

Blades flat, commonly more than 5 mm. wide.

Racemes on the main culm numerous; plants robust, usually more than 1 meter tall, sometimes with stolons. *A. scoparius.*

Racemes on the main culms few; plants commonly less than 1 meter tall.

Plants with stolons; racemes green..... *A. compressus.*

Plants without stolons; racemes purplish brown. *A. Mathewsii.*

Axonopus attenuatus (Presl) Hitchc. Contr. U. S. Nat. Herb. 22: 471. 1922. *Paspalum attenuatum* Presl, Rel. Haenk. 1: 212. 1830.

An erect perennial 50–100 cm. high with compressed shoots; the sheaths are overlapping and strongly keeled, the blades folded; the racemes are numerous and slender, the spikelets 1.5–2 mm. long, obscurely nerved.

Huánuco: Huánuco, *Haenke*, type. Brazil and the Guianas.

Axonopus aureus Beauv. Ess. Agrost. 12. 1812. *Paspalum aureum* HBK. Nov. Gen. & Sp. 1: 93. 1816.

A tall slender branched perennial, the culms wiry and compressed; blades firm, spreading or ascending, flat; inflorescence showy, of 4–15 digitate golden-brown spikes 5–7 cm. long, the stiff hairs in tufts below the spikelets as well as along the margins.

San Martín: San Roque, fairly abundant, 1,400 meters, *Williams 7764*. Bolivia and Brazil to Salvador and Puerto Rico.

The plant is a handsome and showy one because of the brightly colored inflorescences.

Axonopus capillaris (Lam.) Chase, Proc. Biol. Soc. Wash 24: 133. 1911. *Paspalum capillare* Lam. Tabl. Encycl. 1: 176. 1791. *P. minutum* Trin. Linnaea 10: 293. 1836.

Plants slender, much branched from the base, commonly 10–15 cm. high, nearly glabrous; blades thin, bright green, 2.5–5 cm. long, 4 mm. wide; peduncles long and almost capillary, the few racemes 1.5–2.5 cm. long, green.

Huánuco: Cochero, *Poeppig*, type of *P. minutum*.—Junín: La Merced, 1,200 meters, along sandy trail, *5609*. Chanchamayo Valley, 1,800 meters, *Schunke 250, 242a*. Above San Ramón, *Schunke A47*.—Without locality: *Poeppig 829; Lechler 2284*. Bolivia and Brazil to Central America.

Axonopus compressus (Sw.) Beauv. Ess. Agrost. 12. 1812. *Milium compressum* Sw. Prodr. Veg. Ind. Occ. 24. 1788. *Paspalum compressum* Raspail, Ann. Sci. Nat. 5: 34. 1804.

Plants almost glabrous, usually producing long leafy stolons; blades broad and flat, obtuse, short, 6–10 mm. wide; flowering culms erect or ascending, compressed, their blades 8–10 cm. long; racemes 2–5, very slender, green.

Junín: Colonia Perené, *Hitchcock 22062*.—Loreto: Río Itaya, *Williams 137*. Mishuyacu, 100 meters, *Klug 995*. Fortaleza, Yurimaguas, in pasture, 200 meters, *Williams 4477*. Tropical regions of both hemispheres. "Nudillo."

Sometimes called carpet grass in the United States.

Axonopus elegantulus (Presl) Hitchc. Contr. U. S. Nat. Herb. 24: 433. 1927. *Paspalum elegantulum* Presl, Rel. Haenk. 1: 211. 1830. *P. gregoriense* Mez, Bot. Jahrb. 56: Beibl. 125: 10. 1921.

Erect or decumbent, forming dense clumps, 1 meter high or less; sheaths strongly keeled, with a hispidulous collar, the blades long, narrow and folded; racemes few or several, erect, 4–6 cm. long, often purple.

Cuzco: Ollantaitambo, *Hitchcock 22515*.—Huancavelica: Río Mantaro, 1,300 meters, *Weberbauer 6570*, type collection of *P. gregoriense*.—Huánuco: Mountains of Huánuco, *Haenke*, type.

Yanano, decaying rock outcrop, 1,800 meters, *3760*. Mito, steep slopes, 2,700 meters, *3270, 3324, 1498*. Known only from Peru.

Axonopus Mathewsii (Mez) Hitchc. Contr. U. S. Nat. Herb. 24: 432. 1927. *Paspalum Mathewsii* Mez, Repert. Sp. Nov. 15: 62. 1917.

Plants erect, glabrous, 40–100 cm. high; blades flat, 1 cm. wide or less; racemes 2–8, slender, lax, spreading, 5–10 cm. long.

Amazonas: Chachapoyas, *Mathews 3239*, type. Also in Ecuador.

Axonopus scoparius (Flügge) Hitchc. Contr. U. S. Nat. Herb. 22: 471. 1922. *Paspalum scoparium* Flügge, Monogr. Pasp. 124. 1810. *P. iridifolium* Poepp. Reise 2: 324. 1836.

Plants stout, glabrous, erect, sometimes 2 meters high, with long stout stolons; blades green, as much as 3 cm. wide; panicles 30 cm. long or less, the numerous very slender racemes green or purple.

Cuzco: Machupiccho, 2,400 meters, *Herrera 2018*. San Miguel, *Cook & Gilbert 902*.—Huánuco: Huacachi, 1,950 meters, *3863*. Muña, edge of thicket, 2,100 meters, *4052*. Yanano, decaying rock outcrop, 1,800 meters, *3761*.—Junín: Colonia Perené, *Hitchcock 22080*. La Merced, *Hitchcock 22157*. Brazil to Colombia. Type of *P. iridifolium* from Peru, *Poeppig*.

76. PASPALUM L.

Annuals or perennials; racemes 1–many, spike-like, single or paired at the summit of the culm or racemose along the main axis; spikelets plano-convex, subsessile, usually obtuse, solitary or in pairs, in 2 rows on one side of a narrow or dilated rachis, the back of the fertile lemma toward the rachis; first glume commonly wanting; second glume and sterile lemma usually subequal; fertile lemma commonly obtuse, chartaceous-indurate, with inrolled margins.

Rachis winged (wing suppressed in *P. Humboldtianum*, with silky spikelets). Fruit pale.

Spikelets silky. Rachis brightly colored, membranaceous; perennials.

Rachis 1 mm. wide or less; spikelets, or some of them, paired. *P. Humboldtianum*.

Rachis 3–5 mm. wide; spikelets solitary.

Blades 2–3.5 mm. wide; rachis 3–4 mm. wide. . *P. heterotrichon*.

Blades 5–8 mm. wide; rachis more than 5 mm. wide. . *P. Ceresia*.

Spikelets glabrous.

Racemes not falling from the main axis. Spikelets more than 3 mm. long..... *P. crassum.*

Racemes falling entire from the main axis (tardily in *P. candidum* with spikelets less than 3 mm. long). Rachis green and foliaceous.

Plants perennial, aquatic..... *P. repens.*

Plants annual, terrestrial.

Second glume developed.

Rachis extending beyond the uppermost spikelet; second glume and sterile lemma not loose.

Plants forming low mats. Foliage pilose.. *P. pygmaeum.*

Plants not forming mats.

Spikelets 2–2.2 mm. long, greenish; axis 2–2.5 mm. wide..... *P. prostratum.*

Spikelets not more than 1.8 mm. long, whitish; axis less than 2 mm. wide.

Spikelets distinctly hollowed on the flat side, with raised margin; culms decumbent and branching..... *P. penicillatum.*

Spikelets not hollowed; culms erect, simple. *P. tuberosum.*

Rachis with a spikelet at its apex; second glume and sterile lemma loose.

Second glume and sterile lemma not much larger than the fruit; rachis 2 mm. wide..... *P. Sodiroanum.*

Second glume and sterile lemma much larger than the fruit; rachis about 1 mm. wide or less.

Spikelets 2 mm. long, the glume and sterile lemma not fluted..... *P. flavum.*

Spikelets 2.5 mm. long, the sterile lemma distinctly fluted, the glume slightly so..... *P. racemosum.*

Second as well as the first glume suppressed.

Culms commonly 1 meter long or more; spikelets 2.3–2.5 mm. long..... *P. candidum.*

Culms usually not more than 50 cm. long; spikelets 2 mm. long or less.

Culms vinous purple or purple-tinged; sheaths glabrous or nearly so..... *P. depauperatum.*

Culms pale stramineous; sheaths pilose. *P. lineispatha.*

Rachis not winged or, if narrowly winged, neither foliaceous nor broad and membranaceous with silky spikelets.

Fruit scarcely indurate, pointed; spikelets with long silky white hairs on the margin..... *P. saccharoides.*

Fruit commonly strongly indurate, if relatively thin, the spikelets not long-silky.

Racemes 2, conjugate or approximately so at the summit of the culm, with rarely a third below. Spikelets solitary.

Plants annual, tufted, without stolons..... *P. multicaule.*

Plants perennial, stoloniferous or creeping.

Spikelets elliptic or narrowly ovate, not silky on the margin.

Second glume and sterile lemma glabrous.. *P. vaginatum.*

Second glume pubescent..... *P. distichum.*

Spikelets suborbicular or nearly as broad as long.

Spikelets sparsely silky on the margin, about 1.5 mm. long..... *P. conjugatum.*

Spikelets glabrous, 2–3 mm. long.

Spikelets 2.5–3 mm. long..... *P. notatum.*

Spikelets less than 2.5 mm. long..... *P. minus.*

Racemes 1–many, racemose or fasciculate, not conjugate.

Inflorescence a large flabellate panicle of numerous racemes; spikelets solitary..... *P. fasciculatum.*

Inflorescence not flabellate or, if slightly so, the spikelets in pairs.

Racemes solitary. Spikelets in pairs..... *P. decumbens.*

Racemes 2–many, but solitary in the axillary inflorescences.

Spikelets suborbicular or broadly ovate, not more than 2 mm. long; fruit pale.

Spikelets pubescent with short crisp hairs, in pairs. *P. paniculatum.*

Spikelets glabrous..... *P. Haenkeanum.*

Spikelets elliptic to ovate or obovate, if approaching suborbicular, the fruit dark brown.

Fruit brown.

Spikelets 3 mm. long; fruit not shining; plants robust, often 2 meters tall..... *P. virgatum.*

Spikelets 2–2.5 mm. long; fruit shining; plants rarely more than 1 meter tall.

Sterile lemma finely undulate inside the slightly raised margin, glabrous..... *P. plicatulum.*

Sterile lemma not or very obscurely undulate, appressed-pubescent..... *P. pubiflorum.*

Fruit pale.

Spikelets 1.2 mm. long..... *P. gossipinum.*

Spikelets 2 mm. long or more.

Glume and sterile lemma loose, more or less rumpled, glabrous; spikelets solitary. Rachis 1–2 mm. wide.

Rachis finely pubescent, especially on the inside; blades densely grayish-villous. *P. Bonplandianum.*

Rachis glabrous or obscurely puberulent; blades puberulent.

Spikelets 2.1–2.3 mm. long; rachis 1.5 mm. wide..... *P. Pilgerianum.*

Spikelets 2.5–3 mm. long; rachis 2.5–3 mm. wide..... *P. pallidum.*

Glume and sterile lemma not loose and rumpled; spikelets paired.

Rachis with very narrow margins 0.8–2 mm. wide..... *P. lividum.*

Rachis not at all winged.

Spikelets on relatively long pedicels, loosely arranged in slender racemes in open pyramidal panicles.... *P. microstachyum*

Spikelets subsessile, imbricate ... *P. Barclayi.*

Paspalum Barclayi Chase, Contr. U. S. Nat. Herb. 24: 452. 1927.

Probably perennial, the culms simple, stout, perhaps 1 meter high; sheaths ciliate, the blades flat, 1–2 cm. wide, scabrous on the margins and with long hairs at the very base, otherwise glabrous; racemes 6–10, rather crowded, 3.5–8 cm. long, thick and dense, the rachis 1 mm. wide; spikelets pediceled, paired, 2.8–3 mm. long; glumes sparsely appressed-pubescent.

Lima: Type collected in fields near Callao, *Barclay 311.*

Paspalum Bonplandianum Flügge, Monogr. Pasp. 71. 1810.

A tufted perennial with thick horizontal rhizomes, sometimes with long creeping stolons; sheaths and blades densely grayish-villous, the blades flat, 3–7 mm. wide; racemes 6–10, ascending or spreading, 1.5–5 cm. long, the rachis 1.5 mm. wide, dark purple, finely pubescent, spikelets pediceled, solitary, glabrous, pale or purplish, 2.2–3 mm. long.

Cuzco: Ollantaitambo, *Cook & Gilbert 700.* Also in Ecuador. The species was described originally as from Peru, but the type specimen probably came really from Ecuador.

Paspalum candidum (H. & B.) Kunth, Mém. Mus. Hist. Nat. 2: 68. 1815. *Reimaria candida* H. & B. ex Flügge, Monogr. Pasp. 214. 1810. *P. uniseriatum* Steud. ex Lechl. Berb. Amer. Austr. 55. 1857, nomen.

Annual, loosely branched, the culms often 1 meter long, decumbent at the base, often straggling or even clambering when supported; sheaths smooth or slightly scabrous, the blades flat, softly pilose, 5–12 mm. wide; racemes 8–20, ascending or spreading, 2–4 cm. long, the rachis 2–2.5 mm. wide; spikelets white, oblong, 2.3–2.5 mm. long. They are usually so far apart as to seem to form a single row.

Cuzco: Pillahuata, Cerro de Cusilluyoc, 2,300 meters, open shale slope, *Pennell 13991.*—Huánuco: Muña, 2,100 meters, edge of thicket, *3591.* Mito, 2,700 meters, *1366.*—Junín: Huacapistana, 2,000 meters, *Killip & Smith 24129.*—Lima: Obrajillos, *Wilkes Exped.*—Department unknown: *Lechler 1862,* type of *P. uniseriatum.* Bolivia to southern Mexico. "Huarocia."

Paspalum Ceresia (Kuntze) Chase in Niles, Contr. U. S. Nat. Herb. 24: 153. 1925. *P. membranaceum* Lam. Tabl. Encycl. 1: 177. 1791, non Walt. 1788. *Ceresia elegans* Pers. Syn. Pl. 1: 85. 1805. *C. membranacea* Beauv. Ess. Agrost. 9: 171. 1812. *P. elegans* R. & S. Syst. Veg. 2: 290. 1817, non Flügge, 1810. *Panicum Ceresia* Kuntze, Rev. Gen. 3, pt. 2: 360. 1898.

Perennial, erect, densely villous at the base, the culms tufted, from a short rhizome; blades flat, glaucous, 5–15 cm. long, 3–8 mm. wide, stiffly pilose on the upper surface near the margins; racemes 1–4, ascending or arching, the rachis ribbon-like, purplish or bronze-green with rather bright yellow-brown margins; spikelets crowded, silvery-silky, the hairs longer than the spikelets and concealing them.

Huánuco: Mito, 2,700 meters, edge of abandoned field, *1780.*—Department unknown: *Weberbauer 6449.* Bolivia to Ecuador. Described originally from Peru.

Paspalum conjugatum Berg. Act. Helv. Phys. Math. 7: 129. 1762.

A perennial, widely creeping, the culms compressed, the flowering branches suberect, 1 meter high or less; blades flat, up to 20 cm. long, about 8 mm. wide; racemes normally 2, divaricate, arcuate, slender, 10–12 cm. long; spikelets pale yellow, flattened, imbricate, 1.5 mm. long, with few long silky hairs along the margins.

Huánuco: Muña, 2,100 meters, moist trail border, *4057.*—Junín: Colonia Perené, *Hitchcock 22089.*—Lima: Chosica, 900 meters, among willows along river, *2878;* stony banks and flats along river, *506.*—Loreto: Timbuchi, upper Río Nanay, edge of forest, *Williams 1188.* Lower Río Nanay, *Williams 345.* Paraíso, upper Nanay, *Williams 3222.* Mishuyacu, 100 meters, *Klug 997.* Tropics of both hemispheres. "Tarurco."

One of the most common weedy grasses of the lowlands of tropical America, frequently invading cultivated ground.

Panicum crassum Chase in Hitchc. Contr. U. S. Nat. Herb. 17: 239. 1913.

A coarse erect annual, sometimes 1 meter high, branched from the base; blades flat, coarsely papillose-hirsute, 11–25 cm. long, 1.5–2.5 cm. wide, tapering to a rounded base; racemes 4–several, pale, ascending, thick, the rachis narrowly winged, 3–4 mm. wide, the margins hispidulous; spikelets solitary, crowded, oval, 3.5 mm. long, pale, glabrous.

Junín: Colonia Perené, *Hitchcock 22076.* Also in Mexico.

Paspalum decumbens Sw. Prodr. Veg. Ind. Occ. 22. 1788.

Perennial, decumbent, much branched, the culms slender and compressed; blades flat, 5–10 cm. long, 5–8 mm. wide, velvety-pubescent; racemes solitary, arcuate, 2–3 cm. long, dense, borne on slender peduncles, these usually several from the upper sheaths; spikelets 1.5 mm. long, obovate, glabrous, pale green.

Junín: Chanchamayo Valley, *Schunke 248.* Above San Ramón, 1,500 meters, *Schunke A46.* Yapas, 1,500 meters, dense forest, *Killip & Smith 25468.*—Loreto: Iquitos, in clearing, *Killip & Smith 27361.* Bolivia and Brazil to Central America and the West Indies.

Paspalum depauperatum Presl, Rel. Haenk. 1: 215. 1830.

A loosely branched annual, similar to *P. candidum*, the culms usually shorter, purplish, decumbent, with erect branches, the nodes densely pubescent; sheaths smooth, the blades velvety-pubescent beneath and finely papillose-pubescent above; panicles purple-tinged, the spikelets 2 mm. long.

Ayacucho: Pampalca, 3,200 meters, open hillside, *Killip & Smith 22242*.—Huánuco: Type from Huánuco, *Haenke*. Huánuco (?), *Ruiz 4620*. Bolivia to Venezuela and Colombia.

Paspalum distichum L. Syst. Nat. ed. 10. 2: 855. 1759. *Panicum paspaliforme* Presl, Rel. Haenk. 1: 296. 1830.

A widely creeping perennial, the sheaths loose, the blades spreading, the flowering culms ascending; racemes 2 or rarely 3, divergent; spikelets elliptic, 3–4 mm. long.

Huánuco: Huánuco, *Haenke*, type of *Panicum paspaliforme*.—Lima: Chosica, *Holway 781*. Tropical and subtropical regions of both hemispheres.

Paspalum fasciculatum Willd. in Flügge, Monogr. Pasp. 69. 1810.

A coarse creeping perennial, the culms sometimes several meters long; flowering culms erect, 1–2 meters high; sheaths densely silky-ciliate, at least toward the summit, the flat blades 2 cm. wide, very scabrous on the margins; racemes numerous, 10–12 cm. long, forming a fan-shaped panicle; spikelets 4 mm. long, acuminate.

Based originally in part on material supposed to have been collected in Peru, but the locality data are somewhat doubtful. The species occurs in Ecuador, and may well be found also in Peru. It ranges from Argentina to Mexico.

Paspalum flavum Presl, Rel. Haenk. 1: 220. 1830. *P. mollendense* Mez, Repert. Sp. Nov. 15: 31. 1917.

A glabrous annual, much branched from the base, the culms 20–60 cm. long; sheaths loose, the blades flat, thin, commonly 5–10 cm. long and 5–10 mm. wide; panicles oblong, the numerous racemes approximate, arched, 1–2 cm. long; spikelets 2 mm. long, stramineous to dark purple; rachis scarcely 1 mm. wide, its margins usually inrolled.

Arequipa: Mollendo, *Weberbauer 1553*, type of *P. mollendense*.—Lima: Matucana, 2,400 meters, shale rock slope, *135*. Near Viscas,

1,900 meters, open rocky slopes, *Pennell 14461*.—Department unknown: *Weberbauer 5707*. Also in Chile.

Paspalum gossipinum Mez, Repert. Sp. Nov. 15: 68. 1917.

Perennial, densely tufted, the slender erect culms simple, 35–50 cm. high; blades 4–10 cm. long, 1.5–2 mm. wide, densely covered with long soft spreading white hairs; racemes 2–5, ascending or spreading, 3–5 cm. long; rachis slender, with long white hairs on the margin and upper side; spikelets solitary, 1.2 mm. long, yellowish, glabrous.

San Martín: Cerro Morro near Moyobamba, 1,000 meters, *Weberbauer 4590*, type.

Paspalum Haenkeanum Presl, Rel. Haenk. 1: 210. 1830.

A straggling or creeping perennial, the culms long and leafy; sheaths overlapping, the blades somewhat glaucous, flat, spreading, 4–8 cm. long, 6–9 mm. wide, rounded at the base, usually puberulent beneath; racemes 3–5, aggregate, ascending, 2–4.5 cm. long, the rachis flat and glabrous; spikelets broadly ovate.

Huánuco: Type from mountains of Huánuco, *Haenke*.—Lima: Callao, *Wilkes Exped*. Lima, *Barranca 537*. Santa Clara, *Holway 786*. Known only from Peru.

Paspalum heterotrichon Trin. Gram. Icon. 3: *pl. 285*. 1831.

A tufted perennial, the culms very slender, wiry, 90 cm. high or less; blades spreading, involute toward the apex, 2–3.5 mm. wide, minutely puberulent on the upper surface, sometimes glabrous beneath; racemes 2–7, ascending-falcate, 1–6 cm. long; spikelets solitary, closely imbricate, whitish, with copious glistening white hairs, about 2.5 mm. long; rachis 3–4 mm. wide.

Ayacucho: Aina, 800 meters, open woods, *Killip & Smith 22737, 22535*.—Huánuco: Yanano, 1,800 meters, steep rocky slope, *3749*. Brazil to Panama and Haiti.

Paspalum Humboldtianum Flügge, Monogr. Pasp. 67. 1810. *P. ciliatum* HBK. Nov. Gen. & Sp. 1: 87. *pl. 24*. 1816, non Lam. 1791.

Perennial, tufted, the culms 50–80 cm. high, erect from a hard decumbent base, commonly branched below; sheaths and blades pilose, the blades spreading, flat, sharp-pointed, 8–15 mm. wide; racemes 2–5, ascending or spreading, rather lax, 5–10 cm. long; rachis dull purple; spikelets purplish, covered with glistening white silky hairs.

Amazonas: Chachapoyas, 2,700 meters, common, *Williams 7536*.—Cuzco: Near Chilechile, 2,200 meters, *Weberbauer 7861*.—Lima: Chosica, 900 meters, moist places in river valley, *517*. Mountains from Argentina to Mexico.

Paspalum lineispatha Mez, Repert. Sp. Nov. 15: 27. 1917.

Similar to *P. candidum* but smaller, the culms weak, decumbent, 10–30 cm. long; sheaths and blades softly pilose; racemes 2–12, spreading, 1–1.5 cm. long, the rachis 1.5 mm. wide; spikelets 1.8 mm. long.

Ancash: Below Hacienda Cajabamba, between Samanco and Caraz, 3,000–3,500 meters, *Weberbauer 3142*, type. Also in Bolivia.

Paspalum lividum Trin. in Schlecht. Linnaea 26: 383. 1854.

Perennial, tufted, glabrous, the culms compressed, ascending from a decumbent base; blades flat, lax; racemes 3–5, subflexuous, approximate on a very slender axis, the rachis rather broad; spikelets glabrous, usually lurid purplish, the glume and sterile lemma thin.

Huánuco: Huánuco, *Ruiz* (?).—Department uncertain: Canruru, Andes of Peru, *Savatier*. Paraguay to Mexico.

Paspalum microstachyum Presl, Rel. Haenk. 1: 215. 1830.

An annual, nearly glabrous, the slender erect culms usually 50 cm. high or less, in small tufts, branched below; blades flat, spreading, 4–15 cm. long, 8–20 mm. wide; racemes 7–25 or more, spreading, slender; spikelets elliptic, yellowish green, 1.5 mm. long, minutely pubescent.

Loreto: Huallaga, Yurimaguas, a weed in abandoned land, *Williams 4636*. Brazil to Guatemala.

Paspalum minus Fourn. Mex. Pl. 2: 6. 1886.

A perennial, forming dense low mats, the culms rarely more than 30 cm. long; blades flat, 5–15 cm. long, sometimes conspicuously ciliate; racemes 2–3, slender, short, the spikelets 2–2.5 mm. long, oval.

Loreto: Iquitos, waste places, *Killip & Smith 26906*. Bolivia and Paraguay to southern Mexico.

Paspalum multicaule Poir. in Lam. Encycl. Suppl. 4: 309. 1816.

A low annual, much branched from the base and lower nodes; sheaths and blades pilose, the blades narrowly linear, elongate;

racemes 2 at the summit of the culm, rarely solitary, slender, about 3 cm. long; spikelets orbicular, minute, pale, irregularly sprinkled with globular hairs.

Junín: Colonia Perené, sandy field, 590 meters, *Hitchcock 22087*. Bolivia and Brazil to the West Indies.

Paspalum notatum Flügge, Monogr. Pasp. 106. 1810.

Culms tufted, ascending from a short hard rhizome, forming tough mats; blades flat, 5–8 mm. wide, often elongate; racemes 2, approximate, divaricate, usually arcuate; spikelets solitary, broadly ovate, 2.5–3 mm. long; glume and sterile lemma papery, shining.

Huánuco: Huánuco, 2,100 meters, along ditch, *3519*. General in tropical America.

Paspalum pallidum HBK. Nov. Gen. & Sp. 1: 88. 1816.

Perennial, the branched culms 75 cm. long or less, decumbent and rooting at the lower nodes; sheaths pilose at the summit or glabrous; blades flat, 4–12 cm. long, 5–10 mm. wide, puberulent or glabrous, usually ciliate; racemes 5–20, approximate, ascending, 2–3.5 cm. long, the rachis greenish purple, 2 mm. wide, obscurely puberulent; spikelets solitary, crowded, oblong, glabrous, 2.5–3 mm. long.

Lima: Matucana, 2,400 meters, grassy swales on mountain side, *356*. Callao, *Wilkes Exped*. Also in Ecuador.

Paspalum paniculatum L. Syst. Nat. ed. 10. 2: 855. 1759.

A coarse branched perennial, usually 1 meter high or more; blades stiffly hairy, flat, 20–30 cm. long, 1.5 cm. wide; racemes numerous, slender, forming an oblong panicle; spikelets minute, crowded, hemispheric, pubescent.

Junín: Chanchamayo Valley, 1,200 meters, *Schunke 244, 463*.—Loreto: Puerto Arturo, edge of forest, *Williams 5024*.—San Martín: San Roque, 1,400 meters, in forest, *Williams 7181*. General in tropical America; a common weed of the lowlands.

Paspalum penicillatum Hook. f. Trans. Linn. Soc. 20: 171. 1851.

Annual, decumbent and branched, the fertile culms ascending, 15–40 cm. long; blades flat, 3–10 cm. long, 6–12 mm. wide, thin, pilose; panicles narrow and elongate, the racemes several or many, 1–2 cm. long, spreading, mostly in pairs; spikelets whitish, 1.7 mm. long.

Cajamarca: Cutervo, *Jelski 407*.—Huánuco (?): Tambillo, *Jelski 582*.—Lima: Lurín, 60 meters, sandy lomas near the sea, *5947*. Bolivia to Ecuador.

Paspalum Pilgerianum Chase in Hitchc. Contr. U. S. Nat. Herb. 24: 445. 1927. *P. Bonplandianum* var. *glabrescens* Pilger, Bot. Jahrb. 27: 17. 1899.

A tufted perennial with slender rhizomes, the culms simple, ascending or spreading, 10–35 cm. high; lower sheaths and blades puberulent, the upper sparsely puberulent or almost glabrous, the blades flat, 2–12 cm. long, 2–5 mm. wide; racemes 3–10, approximate, ascending or spreading, 1–3 cm. long, the rachis 1.5 mm. wide, glabrous; spikelets solitary, pale or purplish, glabrous, crowded, 2.1–2.3 mm. long, oval.

Junín: Gollarisquisga, 4,150 meters, along irrigating ditch, *Hitchcock 22285*. Also in Ecuador.

Paspalum plicatulum Michx. Fl. Bor. Amer. 1: 45. 1803.

Perennial, tufted, 1 meter high or less, the culms simple, compressed; blades elongate, green, 5–15 mm. wide, sometimes sparsely pilose; racemes few or several, arcuate-spreading, 4–8 cm. long; spikelets in pairs, drab, drying brown, oval, the fruit dark brown, shining.

Ayacucho: Aina, 800 meters, in clearing, *Killip & Smith 22604*. Bolivia and Argentina to the United States.

Paspalum prostratum Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. 24: 9. 1900.

A decumbent annual, much branched, similar to *P. penicillatum* but stouter and with somewhat larger leaves; flowering branches 5–30 cm. long; blades 5–12 mm. wide, rounded to subcordate at the base, pilose; racemes 3–12, spreading, 1–3 cm. long; spikelets solitary, mostly in 2 rows, whitish, about 2.1 mm. long.

Ayacucho: Pampalca, 3,200 meters, open hillside, *Killip & Smith 22215*. Bolivia to Mexico, in the mountains.

Paspalum pubifolium Presl, Rel. Haenk. 1: 219. 1830.

Similar to *P. plicatulum* and perhaps not distinct; blades densely pubescent beneath, long-pilose above; sterile lemma not undulate, or only obscurely so.

Huánuco: Mountains of Huánuco, *Haenke*, type.—Junín: Colonia Perené, *Hitchcock 22098*.

Paspalum pygmaeum Hack. Repert. Sp. Nov. 11: 18. 1912. *P. minimum* Meyen, Reise Erd. 1: 484. 1834, nomen. *P. Haenkeanum* var. *minimum* Nees, Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 6. 1841.

A small annual, branched at the base and forming mats, the spreading culms 5–10 cm. long, the ends ascending from geniculate nodes; blades pilose, commonly 3 cm. long or less; panicles small, the 3–6 racemes mostly less than 12 mm. long, usually equaled or exceeded by the uppermost blades; spikelets 1.7–1.9 mm. long.

Junín: La Quinhua, 3,600 meters, steep grassy slope, *2030.*—Lima: Río Blanco, 4,500 meters, upland slope, *804.*—Puno: Pucará, *Weberbauer 415.* Maravillas, *Meyen*, type of *P. minimum.* Chuquibambilla, 4,000 meters, rocky clay slope over limestone, *Pennell 13377.* Araranca, rocky siliceous slope, 4,200 meters, *Pennell 13481.* Also in Bolivia.

Paspalum racemosum Lam. Tabl. Encycl. 1: 176. 1791. *P. stoloniferum* Bosc, Trans. Linn. Soc. 2: 83. *pl. 16.* 1794. *Milium latifolium* Cav. Icon. Pl. 3: 37. *pl. 273.* 1794. *P. purpureum* R. & P. Fl. Peruv. 1: 47. 1798. *Paspalianthum stoloniferum* Desv. Opusc. 59. 1831. *Maizilla stolonifera* Schlecht. Bot. Zeit. 8: 605. 1850. *P. biglume* Steud. Syn. Pl. Glum. 1: 24. 1854.

Annual, glabrous, the culms sparingly branched, decumbent and rooting at the lower nodes, 1 meter long or less; sheaths loose, the blades flat, mostly 3–12 cm. long, 1–2.5 cm. wide, rounded to subcordate at the base; panicles narrow, the racemes numerous, approximate, spreading or ascending, 1–2.5 cm. long, the rachis 1 mm. wide; spikelets 2.5 mm. long, usually purple or rusty brown, sometimes pale.

Lima: Between Miraflores and Lima, common weed in fields, *Hitchcock 22338.* Santa Clara, *Rose 18742.*—Piura: Negritos, *Haught F13.* Cerro Prieto, 720 meters, *Haught F137.* Ranging to Colombia. Originally described from Peru, as were *P. stoloniferum* and *Milium latifolium.* *P. purpureum* is reported by Ruiz and Pavón from Lima, Chancai, and Huánuco. "Maicillo."

Ruiz and Pavón state that the plant is an important and valuable forage grass.

Paspalum repens Berg. Act. Helv. Phys. Math. 7: 129. *pl. 7.* 1772.

An aquatic or subaquatic perennial, the stems usually submerged and the floating branches buoyed up by inflated sheaths; blades

flat and thin, commonly 1–1.5 cm. wide; panicles composed of very numerous spreading slender racemes; spikelets small, flat, elliptic, whitish, arranged in 2 rows on a broad green rachis.

Loreto: Pebas, in forest, *Williams 1856*. Lower Río Nanay, *Williams 509*. General in tropical America.

Paspalum saccharoides Nees in Trin. Gram. Icon. 1: *pl. 107*. 1828.

A coarse tufted perennial with stolons, the branched culms often 2 meters high; blades flat, elongate, 1–1.5 cm. wide, involute toward the apex, pale and appressed-pubescent on the upper surface; racemes numerous, mostly 15 cm. long or more, slender, drooping, forming a feathery panicle; spikelets small, narrow, margined with silky white hairs 6–8 mm. long.

Huánuco: Chicoplaya, *Ruiz*. Bolivia and Brazil to Costa Rica and the Lesser Antilles.

Paspalum Sodiroanum Hack. Oesterr. Bot. Zeitschr. 51: 237. 1901. *P. peruvianum* Mez, Repert. Sp. Nov. 15: 28. 1917.

Annual, decumbent, branched, the culms 1 meter long or more; blades flat, 7–18 cm. long, 7–12 mm. wide; panicles oblong, the numerous racemes approximate, ascending, 1–4 cm. long; spikelets 2 mm. long, the sterile lemma loose and rumpled; terminal spikelet purple.

Lima: Between Tambo de Viso and Chaupichaca, *Weberbauer 137*, type of *P. peruvianum*. Also in Ecuador.

Paspalum tuberosum Mez, Repert. Sp. Nov. 15: 29. 1917.

An erect perennial (?), branched at the base, the slender culms 12–30 cm. high; blades pilose or glabrate, 4–5 cm. long, 3 mm. wide; panicle 3–4 cm. long, with 4–9 ascending or spreading racemes; spikelets pale, 1.7 mm. long.

Cajamarca: San Pablo, *Weberbauer 3815*. San Miguel, *Weberbauer 3932*.

The species is known only from the two collections cited. Although described as a perennial, Mrs. Chase (Contr. U. S. Nat. Herb. 24: 438. 1927) reports that probably it is an annual, since the related species are of annual duration. She states, further, that there seems to be no justification for the specific name *tuberosum*.

Paspalum vaginatum Sw. Prodr. Veg. Ind. Occ. 21. 1788. *P. Kleineanum* Presl, Rel. Haenk. 1: 209. 1830.

A widely creeping perennial; sheaths loose, the blades spreading, involute-margined, 2–6 mm. wide, tapering from base to apex; flowering branches ascending, commonly 20–30 cm. high; racemes 2, divergent; spikelets flat, acuminate, 3–4 mm. long.

Lima: Callao and Lima, *Didrichsen 4384*. Seacoasts and brackish soil of both hemispheres. Type of *P. Kleineanum* from Peru.

Paspalum virgatum L. Syst. Nat. ed. 10. 2: 855. 1759.

A coarse erect perennial, often forming large clumps 1–2 meters high; blades flat, elongate, 1–2 cm. wide, with scabrous margins; racemes several or many, 5–12 cm. long, dense, stout, forming a large panicle; spikelets in pairs, crowded, grayish, becoming rusty brown at maturity, obovate, 3 mm. long, silky-hairy on the margins.

Cuzco: Santa Ana, *Cook & Gilbert 1531*.—Junín: Colonia Perené, *Hitchcock 22073*.—Loreto: La Victoria, in pasture, *Williams 2772*. Marana-cocha near Iquitos, *Williams 1357*. Fortaleza, Yurimaguas, *Williams 4431*. Paraíso, Alto Itaya, *Williams 3227*. General in tropical America.

Paspalum Anderssonii Mez, Repert. Sp. Nov. 15: 71. 1917.—Type said to have been collected in Peru by Andersson. The species is a doubtful one.

77. PANICUM L.

Annuals or perennials, diverse as to habit; spikelets more or less compressed dorsiventrally, arranged in open or compact panicles, rarely in racemes; glumes herbaceous, nerved, commonly very unequal, the first often minute, the second usually equaling the sterile lemma, the latter of the same texture and simulating a third glume, bearing in its axil a membranaceous or hyaline palea and sometimes a staminate flower, the palea rarely wanting; fertile lemma chartaceous-indurate, usually obtuse, the nerves obsolete, the margins inrolled.

Spikelets short-pediceled, arranged along one side of the panicle branches and forming more or less spike-like racemes disposed along a simple axis.

Fruit transversely rugose. Plants spreading or creeping.

Spikelets pilose.....*P. Lorentzianum.*

Spikelets glabrous.

Plants perennial. Spikelets not reticulate-veined.

Nodes glabrous.....*P. geminatum.*

Nodes bearded..... *P. barbinode.*

Plants annual.

Spikelets turgid, scarcely flattened, reticulate-veined on the upper half..... *P. fasciculatum.*

Spikelets plano-convex, reticulate-veined only at the tip. *P. ramosum.*

Fruit not rugose.

Blades lanceolate or ovate-lanceolate.

Spikelets hispid and with 2 crateriform glands on the sterile lemma..... *P. pulchellum.*

Spikelets glabrous, without glands.

Blades not more than 5 cm. and usually 2–3 cm. long. *P. stoloniferum.*

Blades 5–10 cm. long or often much longer.

Blades 5–11 cm. long; spikelets green.... *P. frondescens.*

Blades 20–35 cm. long; spikelets purple..... *P. Killipii.*

Blades linear, often elongate.

Rachis pilose with long hairs..... *P. pilosum.*

Rachis without long hairs.

Nodes bearded..... *P. polygonatum.*

Nodes glabrous..... *P. laxum.*

Spikelets in open or contracted panicles, if somewhat racemose along the branches not in one-sided racemes.

Fruit finely transverse-rugose..... *P. maximum.*

Fruit not transverse-rugose.

Plants annual.

Blades ovate-lanceolate or elliptic, one-fifth to one-fourth as broad as long; spikelets not more than 1.5 mm. long. *P. trichoides.*

Blades linear, many times longer than broad; spikelets 2.5–3.5 mm. long..... *P. hirticaule.*

Plants perennial.

First glume not more than one-fourth as long as the spikelet, usually obtuse or truncate..... *P. aquaticum.*

First glume more than one-third as long as the spikelet.

Spikelets viscid, 3 mm. long, obtuse..... *P. glutinosum.*

Spikelets not viscid.

Panicle 40–60 cm. long, the branches in whorls. Spikelets 3.5 mm. long, turgid ..... *P. megiston.*

Panicle usually much less than 40 cm. long, the branches not whorled.

Culms erect or spreading but not much branched or straggling.

Spikelets 6–7 mm. long ..... *P. Urvilleanum.*

Spikelets less than 4 mm. long.

Spikelets about 3.5 mm. long, turgid, sparsely hirsute with stiff hairs ..... *P. Rudgei.*

Spikelets 1.5 mm. long ..... *P. obtusiglume.*

Culms much branched, straggling.

Spikelets 5–7 mm. long ..... *P. zizanioides.*

Spikelets 4 mm. long or less.

Spikelets 1.3–1.5 mm. long ..... *P. trichanthum.*

Spikelets 1.5–3 mm. long.

Spikelets 3 mm. long; sterile lemmas 2. *P. quadriglume.*

Spikelets 1.5–2.5 mm. long.

Spikelets 1.5 mm. long ..... *P. cyanescens.*

Spikelets 2–2.5 mm. long.

Spikelets short-pediceled toward the ends of the panicle branches ... *P. Sellowii.*

Spikelets evenly distributed in the panicle. *P. pantrichum.*

Panicum aquaticum Poir. in Lam. Encycl. Suppl. 4: 281. 1816.

Perennial, decumbent and spreading, glaucous, 50–100 cm. high; blades glabrous, flat, 5–10 mm. wide; panicle spreading, the spikelets 3 mm. long.

Lima: Lima, *Wilkes Exped.; Didrichsen 4394.* Widely dispersed in tropical America.

Panicum barbinode Trin. Mém. Acad. St. Pétersb. VI. Sci. Nat. 1: 256. 1834.

A coarse perennial, the bases branched, long and decumbent, developing very long stolons; blades broad and flat, glabrous; racemes several or numerous, 10 cm. long or less, on an axis 15–20 cm. long, the lowest racemes often branched; spikelets glabrous, 3 mm. long, often purplish.

Cuzco: Santa Ana, *Cook & Gilbert 1427.*—Lima: Santa Clara, *Rose 18630.*—Loreto: Río Itaya, *Williams 1, 84.* Generally distributed in the lowlands of tropical America, perhaps introduced from Africa. "Pará grass."

This is one of the most important of American forage grasses, planted generally in wet regions of low altitude. Often it is cut for green fodder.

Panicum cyanescens Nees, Agrost. Bras. 220. 1829.

Plants perennial, bluish green or glaucous, the culms tufted, 30–50 cm. high; blades flat, firm, erect or spreading, 3–8 cm. long, 4–8 mm. wide, glabrous; panicles open, 3–8 cm. long; spikelets 1.5 mm. long, turgid or subglobose, obtuse, glabrous; first glume obtuse, two-thirds as long as the spikelet.

San Martín: San Roque, 1,400 meters, *Williams 7671, 7435.* Brazil to Trinidad and British Honduras.

Panicum fasciculatum Sw. Prodr. Veg. Ind. Occ. 22. 1788.

An erect annual 1 meter high or less, freely branched; blades flat, bright green, mostly 8–15 mm. wide, long and narrow, glabrous or sparsely hispid; panicles 10–20 cm. long, the several racemes 5–10 cm. long, solitary or fascicled along the axis; spikelets 2–2.5 mm. long, bronze or yellow, glabrous, pointed; first glume one-third as long as the spikelet.

Piura: Tablazo, north of Pariñas Valley, *Haught F135.* General in tropical America.

Panicum frondescens Mey. Prim. Fl. Esseq. 56. 1818.

Culms much branched, ascending from a decumbent or creeping base, 30–50 cm. high; blades lanceolate, 12–30 mm. wide, bright green; panicles green, the racemes numerous, crowded, the lower 2.5 cm. long; spikelets glabrous, 2.5 mm. long.

Junín: La Merced, 1,200 meters, *5646.* Chanchamayo Valley, 1,200 meters, *Schunke 129.*—Loreto: Río Nanay, in forest, *Williams 589.*—San Martín: Tarapoto, 750 meters. *Williams 5554,*—San Roque, in forest, 1,400 meters, *Williams 7518, 6981.* Bolivia and Brazil to Mexico.

Panicum geminatum Forsk. Fl. Aegypt. 18. 1775.

A glabrous perennial, the culms cespitose, 30–80 cm. high, spreading from a decumbent base; blades 10–20 cm. long, 3–6 mm. wide, flat; panicles 12–30 cm. long, the racemes 12–18, erect or

nearly so, rather distant; spikelets glabrous, slightly more than 2 mm. long.

Lima: Lima, *Wilkes Exped.*—Piura: Río Chira, *Spruce 6424.* Caña Dulce, *Haught 205.* Warmer regions of both hemispheres.

Panicum glutinosum Sw. Prodr. Veg. Ind. Occ. 24. 1788.

A coarse perennial, the culms erect from a geniculate base, 1–2 meters high; blades lance-linear, 15–50 cm. long, 1.5–2.5 cm. wide; panicles lax and open, 15–40 cm. long, the lowest branches whorled, ascending; spikelets 3 mm. long, turgid, obtuse, glabrous but viscid; first glume nearly as long as the spikelet.

Huánuco: Pampayacu, 1,050 meters, edge of thicket, *5101.* Casapí, *Mathews 2104.*—Junín: Yapas, 1,400 meters, in forest, *Killip & Smith 25589.* General in tropical America.

Panicum hirticaule Presl, Rel. Haenk. 1: 308. 1830.

Annual, erect or spreading, rarely as much as 1 meter high; sheaths hispid, the blades broad and flat; panicles loose and open; spikelets glabrous, acute, 3 mm. long, green or purplish; first glume half or three-fourths the length of the spikelet.

Huánuco: Huánuco, 2,100 meters, in cornfield, *3526.*—Junín: Colonia Perené, *Hitchcock 22115.* Bolivia to the southwestern United States.

Panicum Killipii Hitchc. Journ. Wash. Acad. Sci. 20: 383. 1930.

A coarse perennial, the culms 1–1.5 meters high, sparsely branched; blades narrowly lanceolate, 20–35 cm. long, 2–3 cm. wide; panicles 15–25 cm. long, the branches spreading, the lowest 12 cm. long or less; spikelets purplish, glabrous, obtuse, 2 mm. long.

Ayacucho: Aina, 750–1,000 meters, *Killip & Smith 22804,* type. Carrapa, *Killip & Smith 22491.*

Panicum laxum Sw. Prodr. Veg. Ind. Occ. 23. 1788. *Vilfa gavana* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants spreading, often rooting at the nodes of the decumbent base, the culms 40–100 cm. long; blades flat or folded, 5–15 mm. wide, narrowed to a rounded or subcordate base; panicles oblong, 5–30 cm. long, the many slender raceme-like branches spreading or ascending; branchlets mostly secund on the lower side of the branches, bearing 2–3 acutish spikelets 1–1.5 mm. long.

Junín: Colonia Perené, *Hitchcock 22064.*—Loreto: Paraíso, Alto Itaya, *Williams 3223.*—Puno: Sangabán, *Lechler 2285,* type of *Vilfa gavana.* General in tropical America.

Panicum Lorentzianum Mez, Bot. Jahrb. 56: Beibl. 125: 1. 1921.

Plants annual, decumbent or suberect, slender, pale when dried; blades broad and flat, pilose; panicles rather lax and open, pale yellowish, the spikelets 3.3 mm. long, reticulate-veined and spreading-pilose.

Tumbes: Plain southeast of Hacienda la Choza, 100–200 meters, *Weberbauer 7714, 7714a.* Argentina.

Panicum maximum Jacq. Coll. Bot. 1: 76. 1786.

A coarse perennial, forming large clumps 1–2.5 meters high, the nodes densely hirsute; sheaths hirsute or glabrous, the long blades flat, 1–3.5 cm. wide, glabrous except on the margins or hirsute on the upper surface near the base; panicle large and open, 20–50 cm. long, the lower branches whorled; spikelets green, oblong, glabrous, 3 mm. long; first glume one-third as long as the spikelet.

Loreto: Yurimaguas, 200 meters, abandoned land, common, *Williams 3856.*—Piura: Piura, *Spruce* in 1865.—San Martín: Río Mayo, Tarapoto, *Williams 6196.* Tarapoto, 750 meters, in pasture, *Williams 6176.* San Roque, 1,400 meters, *Williams 7449.* Said to be a native of tropical Africa, but now naturalized almost throughout the lowlands of tropical America.

Guinea grass is the most common pasture grass of tropical America, and is planted everywhere for forage. It is so tall and rank that cattle feeding on it often are hidden by the plants.

Panicum megiston Schult. Mant. 2: 248. 1824.

A coarse perennial with long creeping base, the culms 1–2 meters high; blades 3–3.5 cm. wide; panicles 40–60 cm. long, open, the main branches spreading or ascending, stiff, in dense whorls; spikelets globular-ovoid, abruptly pointed, 3.5 mm. long, glabrous; first glumes scarcely more than one-third as long as the spikelet.

Loreto: Caballo-cocha, in forest, *Williams 2466.* La Victoria, in forest, *Williams 2824.* Paraguay to Mexico and Cuba.

Panicum obtusiglume Hitchc. Contr. U. S. Nat. Herb. 24: 464. 1927.

A cespitose perennial, the slender culms decumbent at the base, 10–15 cm. high; sheaths pilose, the blades oblong-lanceolate, densely pilose, 10–15 mm. long, 2 mm. wide; panicles exserted, few-flowered, 2–3 cm. long; spikelets globose or oval, pilose, 1.5 mm. long; first glume three-fourths as long as the spikelet.

Huánuco: Tambillo, *Jelski 403,* type.

Panicum pantrichum Hack. Verh. Zool. Bot. Ges. Wien 1915: 72. 1915.

Plants slender, branched, spreading, perennial, rooting at the lower nodes; sheaths pubescent, the blades narrowly lanceolate, pubescent; panicles open, rather few-flowered; spikelets glabrous or pubescent, oval, 2 mm. long, crowded along the upper part of the branches.

San Martín: Tarapoto, 750 meters, *Williams 5877*. Bolivia and Brazil to Panama.

Panicum pilosum Sw. Prodr. Veg. Ind. Occ. 22. 1788.

A decumbent or creeping perennial, rooting from the nodes, the branches and sometimes the main culms erect, the nodes villous or glabrous; blades 4–20 cm. long, 7–15 mm. wide; panicles composed of 10–20 densely flowered, spike-like racemes 1–3 cm. long, the rachis pilose; spikelets green, 1.5 mm. long, glabrous.

Loreto: Timbuchi on Río Nanay, sandy soil, *Williams 861*. Palta-cocha on the upper Río Nanay, *Williams 1268*. Lower Río Nanay, *Williams 382*. Mishuyacu, *Klug 996*. Yurimaguas, 135 meters, in clearing, *Killip & Smith 28207*.—San Martín: San Roque, 1,400 meters, *Williams 7287*. Bolivia and Brazil to Mexico and the West Indies. "Tarro-urcu."

Panicum polygonatum Schrad. in Schult. Mant. 2: 256. 1824.

A branched perennial, the culms widely spreading or creeping, sometimes 1 meter long, the nodes densely pubescent; blades flat, 3–13 cm. long, 8–15 mm. wide, cordate at the base; panicles 7–20 cm. long, the branchlets secund from the lower side of the branches, the rachises sparingly pilose with long weak hairs; spikelets green, 1.5 mm. long, pointed, glabrous.

Junín: Chanchamayo Valley, 1,200 meters, *Schunke 1478*.—Loreto: Fortaleza, Yurimaguas, in pasture, *Williams 4479*. La Victoria, in forest, *Williams 2575*. Río Itaya, in forest, *Williams 240*. Yurimaguas, 135 meters, open swamp, *Killip & Smith 27964*.—San Martín: Tarapoto, 750 meters, *Williams 6740*. San Roque, in forest, *Williams 7034, 7404, 7516*. Bolivia and Brazil to Mexico. "Shucash-quihua."

Panicum pulchellum Raddi, Agrost. Bras. 42. 1823.

A delicate perennial, creeping and rooting, the flowering branches ascending, 20–30 cm. high; blades thin, ovate-lanceolate; panicles

oblong, with small spikelets, the sterile lemma with a pair of small glands.

Puno: Sangabán, *Lechler 2180.* Bolivia and Brazil to Mexico.

Panicum quadriglume (Doell) Hitchc. Contr. U. S. Nat. Herb. 24: 460. 1927. *P. cayennense* var. *quadriglume* Doell in Mart. Fl. Bras. 2, pt. 2: 220. 1877.

An erect cespitose perennial 20–40 cm. high; sheaths hirsute, the blades narrow, erect, pilose; panicles open, pale green; spikelets pointed, 3 mm. long; sterile lemmas 2, much exceeding the dark shining fruit.

San Martín: Tarapoto, edge of path, 750 meters, *Williams 5800.* Bolivia to Paraguay and Brazil.

Panicum ramosum L. Mant. 1: 29. 1767.

An erect or spreading annual, the pubescent culms 20–30 cm. long; blades flat, thin, lance-linear, 3–5 mm. wide, densely pubescent; racemes mostly 1 cm. long or less, loosely flowered, somewhat distant on a villous axis; spikelets 2.5 mm. long, glabrous, obtuse, the rachis pilose, some of the hairs on the short pedicels as long as the spikelets; first glume rounded or truncate, 1 mm. long.

Lima: San Bartolomé, 1,500 meters, *Weberbauer 5283.* Southern Asia. In America the species is known only from the collection cited here.

Panicum Rudgei R. & S. Syst. Veg. 2: 444. 1817.

A stout perennial, the culms 1 meter high or less, erect or somewhat geniculate; sheaths hirsute, the blades thick, linear, 5–10 mm. wide, rather rigidly ascending, flat or folded, usually densely hirsute; panicles terminal and lateral, forming an oblong inflorescence, open, the branches stiff, the pedicels divaricate; spikelets 3.5 mm. long, strongly nerved, sparsely hirsute; glumes and sterile lemma acuminate.

Without definite locality: Andes of Peru, *Ruiz.* Brazil to British Honduras and Jamaica.

Panicum Sellowii Nees, Agrost. Bras. 153. 1829.

Perennial, the culms branched and straggling, 1 meter long or less; blades thin, ovate-lanceolate, 4–15 cm. long, 1–3 cm. wide, pubescent or velvety; panicles open, 10–20 cm. long, the branches ascending or spreading, the spikelets somewhat appressed along

the upper part; spikelets 2 mm. long, obovate, obtuse, papillose-hispidulous; first glume two-thirds as long as the spikelet.

Puno: Sangabán, *Lechler 2430.* Brazil to Mexico and Cuba.

Panicum stoloniferum Poir. in Lam. Encycl. Suppl. 4: 274. 1816.

Perennial, creeping, freely branched, 10–50 cm. long, the flowering branches ascending; blades lanceolate, 1–5 cm. long, 3–15 mm. wide; panicles 1–5 cm. long, with few to several racemes 5–10 mm. long; spikelets 2.5 mm. long, glabrous.

Junín: Between Puerto Bermúdez and Cahuapanas, 350 meters, wooded banks, *Killip & Smith 26689.* Colonia Perené, *Hitchcock 22057.*—San Martín: San Roque, 1,400 meters, *Williams 7521.* Bolivia and Brazil to Guatemala.

Panicum trichanthum Nees, Agrost. Bras. 210. 1829.

A much-branched straggling perennial, the ascending fertile culms 1–2 meters long; blades oblong-lanceolate, 10–15 cm. long, 1–1.5 cm. wide, bright green, cordate at the base, rather strongly nerved; panicles 10–30 cm. long, open and spreading, very many-flowered; spikelets 1.5 mm. long, green, elliptic, acute; first glume less than one-fifth the length of the spikelet.

Junín: La Merced, 600 meters, in hedge rows on sandy flat, *5309.*—San Martín: San Roque, 1,400 meters, in pasture and forest, *Williams 7232, 7780.* General in tropical America.

Panicum trichoides Sw. Prodr. Veg. Ind. Occ. 24. 1788.

A slender annual, the culms erect or much branched and spreading, the ascending fertile ones 20–40 cm. long; sheaths papillose-hirsute, the blades ovate-lanceolate, thin, cordate, 2–6 cm. long, 1–2 cm. wide, glabrous or sparsely hirsute; panicles open, spreading, 5–20 cm. long, with capillary branches and pedicels; spikelets 1.3 mm. long, elliptic, sparsely hirsute; first glume half as long as the spikelet.

Junín: Puerto Yessup, 400 meters, gravelly stream bed, *Killip & Smith 26333.* Between Puerto Bermúdez and Cahuapanas, 350 meters, wooded banks, *Killip & Smith 26702.* Colonia Perené, 680 meters, in thicket, *Killip & Smith 25002.*—Loreto: Iquitos, *Williams 7922.* Huallaga, Yurimaguas, abandoned land, *Williams 4642.* Puerto Arturo, Yurimaguas, *Williams 5319.* La Victoria, abandoned land, *Williams 3112.* Caballo-cocha, in forest, *Williams*

2493. Nanay hills, *Williams 279*. Mishuyacu, 100 meters, *Klug 994*.—San Martín: San Roque, 1,400 meters, in pasture, *Williams 7448*. General in tropical America. "Puyu-ucsha."

One of the most common weedy grasses of the lowlands of tropical America.

Panicum Urvilleanum Kunth, Rév. Gram. 2: 403. *pl. 115*. 1830. *P. megastachyum* Presl, Rel. Haenk. 1: 305. 1830, non Nees, 1826. *P. Preslii* Kunth, Enum. Pl. 1: 121. 1833.

A stout perennial with strong creeping rhizomes; sheaths villous; panicles open, the branches ascending; spikelets 6–7 mm. long, silky-villous.

Huánuco: Mountains of Huánuco, *Haenke*, type of *P. megastachyum* and *P. Preslii*. Argentina and Chile to southwestern United States.

It is possible that the locality given for the Haenke specimen is incorrect, and that the type of *P. megastachyum* may have come from Chile.

Panicum zizanioides HBK. Nov. Gen. & Sp. 1: 100. 1816.

Plants perennial, branched, decumbent and rooting at the base, the fertile culms 30–60 cm. high or more; blades cordate-clasping, 5–15 cm. long, 1–3 cm. wide; panicle with few short ascending branches, the branchlets short; spikelets 5.5–6 mm. long, green, the first glume almost equaling the spikelet; fertile lemma with a small appendage or crest at the apex.

Loreto (?): Yurimaguas, *Poeppig 2880*.—San Martín: San Roque, 1,400 meters, abundant, *Williams 7786*. Tarapoto, 750 meters, edge of path, *Williams 5767, 6502*. Tropical regions of both hemispheres.

Panicum lanuginosum Presl, Rel. Haenk. 1: 306. 1830, non Ell. 1816. *P. mollicomum* Kunth, Rév. Gram. 1: Suppl. 9. 1830. Type collected in Peru by Haenke. The species is a doubtful one.

Panicum Pavoni Mez, Bot. Jahrb. 56: Beibl. 125: 5. 1921. Type collected in Peru by Pavón. Perhaps not a species of *Panicum*.

78. ICHNANTHUS Beauv.

Annuals or perennials with broad blades; inflorescence and spikelets as in *Panicum*, the first glume often nearly as long as the spikelet; fruit acute or acuminate; margins of the lemma usually

flat; rachilla produced below the lemma as a minute stipe, this bearing on either side membranaceous appendages adnate to the base of the lemma and free above, the appendages often wanting and indicated only by minute excavations.

Appendages of the fertile lemma developed.

Blades 4–7 cm. wide.

Spikelets 7 mm. long.....*I. panicoides.*

Spikelets 5 mm. long.....*I. Weberbaueri.*

Blades 1–2 cm. wide.

Spikelets 3 mm. long, obtuse.....*I. calvescens.*

Spikelets 4–5 mm. long, acute.....*I. peruvianus.*

Appendages of the fertile lemma reduced to scars.

Blades ovate, rather firm, scabrous on the upper surface. *I. axillaris.*

Blades lanceolate or linear-lanceolate, rather thin.

Inflorescence of several dense racemes on the main axis; spikelets with long stiff hairs toward the summit.....*I. minarum.*

Inflorescence paniculate; spikelets glabrous or sparsely pilose.

Spikelets glabrous or occasionally with a few hairs along the margins of the glumes.....*I. pallens.*

Spikelets sparsely pilose.....*I. candicans.*

Ichnanthus axillaris (Nees) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 334. 1917. *Panicum axillare* Nees, Agrost. Bras. 141. 1829.

Creeping and freely branched; blades mostly 1.5–3 cm. wide, bright green, acuminate, unequal at the base; panicles with few or numerous ascending branches; spikelets 3–4 mm. long, sometimes sparsely hispid.

Huánuco: Pampayacu, 1,050 meters, wooded slope, *5027.*— Loreto: Fortaleza, Yurimaguas, in forest, *Williams 4422.* La Victoria, in pasture, *Williams 2639.* Extending to Brazil and the West Indies.

Ichnanthus calvescens (Nees) Doell in Mart. Fl. Bras. 2, pt. 2: 285. 1877. *Panicum calvescens* Nees ex Trin. Gram. Pan. 193. 1826.

Plants decumbent, branched, 1 meter high or less, the sheaths covered densely with very long, pale hairs or sometimes glabrate; blades lanceolate, falcate, long-attenuate, usually velvety-hairy,

1–3.5 cm. wide; panicles large, lax, open, 40 cm. long or less; spikelets glabrous, 3 mm. long.

Junín: La Merced, at 600 meters, steep brushy banks, *5535*. Brazil and Bolivia.

Ichnanthus candicans (Nees) Doell in Mart. Fl. Bras. 2, pt. 2: 291. 1877. *Panicum candicans* Nees, Agrost. Bras. 133. 1829. *P. maynense* Trin. Linnaea 10: 298. 1836.

A creeping perennial, branched; sheaths and blades villous, the blades small, sometimes very narrow; glumes sparsely pilose, caudate-acuminate; panicles green.

Junín: Colonia Perené, *Hitchcock 22069*.—San Martín: Tocache, *Poeppig*, type of *P. maynense*. San Roque, 1,400 meters, common in forest, or among stones in brook, *Williams 7169, 7159, 7759*. Bolivia to Ecuador and Brazil.

Ichnanthus minarum (Nees) Doell in Mart. Fl. Bras. 2, pt. 2: 294. 1877. *Oplismenus minarum* Nees, Agrost. Bras. 268. 1829. *O. secundus* Presl, Rel. Haenk. 1: 322. 1830. *Panicum secundum* Steud. Nom. Bot. ed. 2. 2: 263. 1842. *P. sandiense* Mez, Bot. Jahrb. 56: Beibl. 125: 5. 1921.

A branched and straggling perennial, glabrous; blades bright green, lanceolate, 1–2 cm. wide, long-attenuate, short-petiolate; inflorescence narrow, 3–10 cm. long, with 3–several ascending, dense and stout racemes 1–2 cm. long, purplish; first glume longer, caudate.

Ayacucho: Carrapa, 1,500 meters, among shrubs. *Killip & Smith 22383, 22344*. Aina, 800 meters, open woods, *Killip & Smith 22735*.—Huánuco: Piedra Grande, 1,500 meters, steep hillsides, *3670, 3682*.—Junín: Between Tarma and La Merced, *Hitchcock 22153*.—Puno: Sandía, *Weberbauer 545*, type of *P. sandiense*. Bolivia and Brazil. Type of *Oplismenus secundus* collected in Peru by Haenke.

Ichnanthus pallens (Sw.) Munro ex Benth. Fl. Hongk. 414. 1861. *Panicum pallens* Sw. Prodr. Veg. Ind. Occ. 23. 1788.

Plants creeping and freely branched, the slender culms ascending; blades flat, lanceolate, asymmetric, 1–2 cm. wide, glabrous, long-attenuate; panicles with several or numerous ascending branches, terminal and axillary; spikelets 3–4 mm. long, glabrous.

Junín: Yapas, 1,400 meters, in forest, *Killip & Smith 25581*.—Loreto: Caballo-cocha, in forest, *Williams 2042*.—Puno: Sangabán, *Lechler 2187*. General in tropical America.

Ichnanthus panicoides Beauv. Ess. Agrost. 57. *pl. 12, f. 1.* 1812.

Culms solitary or in small clumps, erect or ascending, naked below; lower sheaths distant, without blades, the upper overlapping; blades elliptic, rather thick and firm, 8–20 cm. long; panicle few-flowered.

Puno: Sangabán, *Lechler 2675.* Brazil to the Guianas.

Ichnanthus peruvianus Mez, Repert. Sp. Nov. 15: 129. 1918.

A spreading perennial, branched, sometimes 1 meter high; sheaths villous, the blades narrowly lanceolate, 1–1.5 cm. wide, scaberulous above and velvety beneath; panicles spreading, 10–20 cm. long; spikelets glabrous, 4–5 mm. long, the second glume and sterile lemma blunt.

Puno: Sandía, 1,500–1,800 meters, *Weberbauer 1131*, type. Also in Bolivia.

Ichnanthus Weberbaueri Mez, Repert. Sp. Nov. 15: 127. 1918.

An erect perennial about 60 cm. high; sheaths imbricate, glabrous, the blades narrowly lanceolate, 40 cm. long and 4 cm. wide or smaller, glabrous, or sparsely pilose beneath; panicles many-flowered, about 20 cm. long; spikelets acutish, 5 mm. long.

Puno: Near Chunchosmayo, in forest, 900 meters, *Weberbauer 1236*, type.

79. **LASIACIS** (Griseb.) Hitchc.

Large branched perennials, the culms often woody and climbing; blades flat, firm, commonly lanceolate and narrowed into a short petiole; spikelets arranged in small or large, open panicles, subglobose, placed obliquely on the pedicels; first glume broad, somewhat inflated-ventricose, usually not more than one-third the length of the spikelet; second glume and sterile lemma subequal, broad, abruptly apiculate, shining, many-nerved, glabrous or woolly only at the apex; fertile lemma white, bony, obovoid, obtuse, it and the palea bearing at the apex in a slight depression a tuft of woolly hairs.

Culms erect, not branched, herbaceous; blades up to 40 cm. long and 5 cm. wide, deeply cordate-clasping.....*L. procerrima.*

Culms climbing, much branched, woody; blades commonly less than 20 cm. long, narrowed or somewhat cordate at the base.

Ligule noticeable, brown, 2 mm. long.....*L. ligulata.*

Ligule inconspicuous, hidden by the mouth of the sheath, 1 mm. long or less.

Blades glabrous on both surfaces. Panicles few-flowered, 5–10 cm. long ..... *L. divaricata.*

Blades pubescent on one or both surfaces.

Blades narrowly lanceolate, 8–10 times as long as wide; panicles large and open ..... *L. sorghoidea.*

Blades ovate-lanceolate, 3–5 times as long as wide; panicles commonly compact and rather narrow ..... *L. ruscifolia.*

Lasiacis divaricata (L.) Hitchc. Contr. U. S. Nat. Herb. 15: 16. 1910. *Panicum divaricatum* L. Syst. Nat. ed. 10. 2: 871. 1759.

Plants commonly glabrous except on the margins of the sheaths, the woody culms up to 4 meters long; blades 5–12 cm. long, 5–15 mm. wide, scabrous on the margin; panicles 5–20 cm. long, loosely flowered, the branches often reflexed; spikelets 4 mm. long.

Cuzco: San Miguel, *Cook & Gilbert 923.*—Loreto: Yurimaguas, 135 meters, in woods, *Killip & Smith 27561.* Widely distributed in tropical America.

Lasiacis ligulata Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 337. 1917. *Panicum megacarpum* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants clambering to a height of 5–10 meters; ligule 1–2 mm. long; blades narrowly lanceolate, 6–12 cm. long, narrowed at the base, puberulent beneath; panicles 5–10 cm. long; spikelets 4 mm. long, black at maturity.

Ayacucho: Near Kimpitiriki, 400 meters, edge of forest, *Killip & Smith 22937.*—Huánuco: Below Santo Domingo, 1,200 meters, *4250.*—Junín: La Merced, in hedges, 600 meters, *5302; Killip & Smith 23451.* Puerto Yessup, 400 meters, *Killip & Smith 26527.* Cahuapanas, 340 meters, *Killip & Smith 26726.*—Loreto: Caballococha, in forest, *Williams 2035.* Lower Río Nanay, *Williams 399.* San Juan, Iquitos, *Williams 3717.* Pinto-cocha, Río Nanay, in forest, *Williams 789, 781.* Santa Rosa, Yurimaguas, *Williams 4780.* Paraíso, Alto Itaya, *Williams 3341, 3262.* Mishuyacu, *Klug 1398.* Yurimaguas, *Killip & Smith 29085.* Iquitos, *Killip & Smith 27125, 27088.*—Puno: Sangabán, *Lechler 2219.* Bolivia and Brazil to Trinidad. "Rarecilla," "maicillo de altura," "carrizo."

The name *Panicum megacarpum* was based on *Lechler 2219.*

Lasiacis procerrima (Hack.) Hitchc. Proc. Biol. Soc. Wash. 24: 145. 1911. *Panicum procerrimum* Hack. Oesterr. Bot. Zeitschr. 51: 431. 1901.

Culms coarse and erect, forming clumps, sometimes 4 meters high and 1 cm. thick, glabrous and glaucous; blades narrowly lanceolate; panicles open and much branched, up to 1 meter long, the branches naked below, finally spreading widely, the lower whorled, as much as 40 cm. long; spikelets 3–4 mm. long.

San Martín: Tarapoto, in forest, *Williams 6081, 6611*. Venezuela to Mexico.

Lasiacis ruscifolia (HBK.) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 339. 1917. *Panicum ruscifolium* HBK. Nov. Gen. & Sp. 1: 101. 1816.

Plants coarse, much branched, clambering to a height of 3 meters or more; blades sometimes 4.5 cm. wide, pilose or glabrous beneath, glabrous or scabrous above, the sheaths glabrous or nearly so; panicles scarcely exserted; spikelets 3–4 mm. long.

Huánuco: Pozuzo, 600 meters, *4563*.—Junín: Puerto Bermúdez, 375 meters, in forest, *Killip & Smith 26441*.—Loreto: Balsapuerto, *Killip & Smith 28675*. Ranging to Mexico and the West Indies.

Lasiacis sorghoidea (Desv.) Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 338. 1917. *Panicum sorghoideum* Desv. ex Hamilt. Prodr. Ind. Occ. 10. 1825.

Plants clambering to a height of 5–7 meters, the strong central cane sometimes 1 cm. thick; sheaths and blades velvety-pubescent, or the sheaths glabrate; blades about 20 cm. long and 2.5 cm. wide or smaller; panicles 10–20 cm. long; spikelets 4–5 mm. long.

Ayacucho: Estrella, 500 meters, in dense woods, *Killip & Smith 22646*.—Huánuco: Muña, 2,100 meters, *3914*. Pozuzo, 600 meters, *4571*.—Junín: La Merced, 600 meters, *5298*; *Killip & Smith 23998*. Eneñas, 1,800 meters, *Killip & Smith 25615*.—Loreto: Puerto Arturo, in forest, *Williams 5216*. Pebas, *Williams 1782*. Fortaleza, Yurimaguas, *Williams 4359*. Santa Rosa, Yurimaguas, *Williams 4939*. Recreo, Yurimaguas, *Williams 3918*.—San Martín: San Roque, edge of forest, *Williams 7184*. General in tropical America. "Carrizo."

80. HYMENACHNE Beauv.

Coarse perennials of wet places, decumbent at the base and rooting at the lower nodes, the stems stout, simple; blades elongate,

lanceolate, cordate-clasping; spikelets acuminate, short-pedicellate, in long, dense, spike-like or interrupted panicles; first glume half to one-third as long as the spikelet, a distinct stipe below the second glume; sterile lemma 5-nerved, acuminate; lemma and palea membranaceous, the margins of the lemma thin, not inrolled.

Hymenachne donacifolia (Raddi) Chase, Journ. Wash. Acad. Sci. 13: 177. 1923. *Panicum donacifolium* Raddi, Agrost. Bras. 44. 1823. *P. polystachyum* Presl, Rel. Haenk. 1: 312. 1830.

A glabrous perennial 1–1.5 meters high; blades 2.5–5 cm. wide, elongate; inflorescence long and narrow, with very numerous closely set, densely flowered, ascending or suberect branches.

Loreto: Manfinfa, edge of Río Nanay, *Williams 1132*. Edge of forest, La Victoria, *Williams 3094*. Santa Rosa, 135 meters, *Killip & Smith 28986*. Extending to Brazil, Cuba, and Panama. "Gramalote."

81. **HOMOLEPIS** Chase

Perennials with flat blades and narrow panicles; spikelets rather large, subfusiform; first and second glume equal or the first somewhat longer, 7–9-nerved; sterile lemma nearly as long as the glumes, infolding the fertile lemma and enclosing a narrow hyaline palea; fruit elliptic, smooth and shining.

Homolepis aturensis (HBK.) Chase, Proc. Biol. Soc. Wash. 24: 146. 1911. *Panicum aturense* HBK. Nov. Gen. & Sp. 1: 103. *pl. 33*. 1816.

Plants creeping and straggling, the ascending culms 30–60 cm. high or more; sheaths and blades pilose and ciliate, the blades short, 1–1.5 cm. wide; panicles 5–10 cm. long, the slender branches erect or ascending, the spikelets green.

Loreto: Caballo-cocha, in forest, *Williams 2205*. Iquitos, *Williams 7964*. Lower Río Nanay, *Williams 311*. Fortaleza, Yurimaguas, in pasture, *Williams 4210*. Nanay Hills, *Williams 262*. Bolivia and Brazil to Mexico. "Toro urcu."

82. **ISACHNE** R. Br.

Perennials or rarely annuals; blades flat and broad; panicles open or condensed; spikelets small, subglobose; glumes subequal; lower floret perfect or staminate, its lemma and palea indurate and similar in form to those of the upper floret; both fruits plano-convex, nearly equal in size, usually remaining attached by the minute rachilla joint between them.

Blades 15 cm. long or more; panicles large, the branches many-flowered, ascending.....*I. arundinacea.*

Blades usually 5 cm. long or less; panicles small, the branches few-flowered, spreading.....*I. rigens.*

Isachne arundinacea (Sw.) Griseb. Fl. Brit. W. Ind. 553. 1864. *Panicum arundinaceum* Sw. Prodr. Veg. Ind. Occ. 24. 1788.

Plants perennial, scandent sometimes to a height of 6 meters, branched; blades mostly 1.5–2 cm. wide, scabrous; panicles about 12 cm. long, many-flowered, the spikelets crowded near the tips of the slender branches.

Huánuco: Pampayacu, 1,050 meters, sunny thicket, *5048.* Bolivia to Mexico and the West Indies.

Isachne rigens (Sw.) Trin. Gram. Pan. 252. 1826. *Panicum rigens* Sw. Prodr. Veg. Ind. Occ. 23. 1788.

Plants perennial, slender, the culms wiry and trailing; blades firm, spreading, scabrous, 3–5 cm. long, 3–8 mm. wide; panicles 3–5 cm. long, the spikelets pale.

Loreto: Mishuyacu, 100 meters, *Klug 1250.* Iquitos, in swamp, *Killip & Smith 27180.* Ranging to Venezuela and Jamaica.

One of the collections cited was determined as *I. polygonoides* (Lam.) Doell, but it seems to differ in no essential respect from the other, determined by Hitchcock as *I. rigens.* The two so-called species evidently are too closely related.

83. OPLISMENUS Beauv.

Annuals or perennials, branched, creeping, with erect flowering shoots; blades flat, thin, lanceolate or ovate, acuminate or attenuate; spikes several, short, one-sided, thick, rather distant along the main axis; spikelets terete or somewhat compressed laterally, solitary or in pairs, in 2 rows along one side of a narrow, scabrous or hairy rachis; glumes subequal, emarginate or 2-lobed, awned between the lobes; sterile lemma longer than the glumes and fruit, mucronate or short-awned; fertile lemma elliptic, acute, convex or boat-shaped, the margins firm, not inrolled.

Racemes densely flowered, the lower ones 1–2 cm. long..*O. hirtellus.*

Racemes loosely flowered, the lower ones 2–5 cm. long, the lower pairs of spikelets as much as 1 cm. apart.....*O. rariflorus.*

Oplismenus hirtellus (L.) Beauv. Ess. Agrost. 54, 168. 1812. *Panicum hirtellum* L. Syst. Nat. ed. 10. 2: 870. 1759.

Plants perennial, slender, widely creeping, the flowering culms 30–50 cm. high; blades 1–2 cm. wide, with undulate margins, usually pilose beneath; racemes green or purplish, ascending or spreading, with conspicuous long awns.

Ayacucho: Aina, 800 meters, in forest, *Killip & Smith 22783.* Estrella, dense woods, 500 meters, *Killip & Smith 23076.*—Cuzco: San Miguel, *Cook & Gilbert 938.*—Huánuco: Río Huallaga Canyon below Río Santo Domingo, 1,200 meters, *4251.* Pampayacu, 1,050 meters, wooded slope, *5026.*—Junín: Schunke Hacienda, 1,500 meters, in thicket, *Killip & Smith 24727.* Near La Merced, 900 meters, *Killip & Smith 23913.*—Loreto: Puerto Arturo, *Williams 5176, 5232.*—San Martín: San Roque, in forest, *Williams 7020.* Tarapoto, 750 meters, *Williams 5821, 6016.* General in tropical America.

Oplismenus rariflorus Presl, Rel. Haenk. 1: 320. 1830.

Similar to the preceding species, the racemes longer and more slender.

Huánuco: Mountains of Huánuco, *Haenke.* Extending to Mexico.

84. ECHINOCHLOA Beauv.

Mostly large and coarse grasses, annuals or perennials, with compressed sheaths and flat blades; panicles rather compact, composed of few or numerous short dense racemes arranged along the main axis; spikelets hispid or spiny, plano-convex, subsessile; first glume about half the length of the spikelet, pointed; second glume and sterile lemma equal, pointed, mucronate, or the glume short-awned and the lemma long-awned; fertile lemma membranaceous, smooth, pointed.

Ligule a dense line of stiff yellow hairs. Spikelets awned.
E. polystachya.

Ligule none.

Racemes simple, 1–2 cm. long; spikelets awnless or mucronate.
E. colonum.

Racemes branched, more than 2 cm. long; spikelets awned.
E. Crus-galli.

Echinochloa colonum (L.) Link, Hort. Berol. 2: 209. 1833. *Panicum colonum* L. Syst. Nat. ed. 10. 2: 870. 1759. *P. colonum* var. *humile* Nees, Act. Acad. Caes. Leop. Carol. 19: Suppl. 1: 7. 1841; 139. 1843.

A coarse annual less than 1 meter high, glabrous, branched from the decumbent base; blades linear, 5 mm. wide, often cross-barred with purple-brown; racemes commonly 5–10, ascending, distant.

No Peruvian specimens have been seen, but var. *humile* was based on a specimen collected in Peru by Meyen. The species is widely distributed in America.

Echinochloa Crus-galli (L.) Beauv., var. **crus-pavonis** (HBK.) Hitchc. Contr. U. S. Nat. Herb. 22: 148. 1920. *Oplismenus Crus-pavonis* HBK. Nov. Gen. & Sp. 1: 108. 1816.

An erect coarse annual, often 1 meter high or more, branched from the base, the culms sometimes decumbent and rooting; blades 5–15 mm. wide; panicles nodding; awns 1 cm. long or less.

Lima: Lima, *Hitchcock 22342, 22428.* Growing in swamps and ditches thoughout the lowlands of tropical America.

Echinochloa polystachya (HBK.) Hitchc. Contr. U. S. Nat. Herb. 22: 135. 1922. *Oplismenus polystachyus* HBK. Nov. Gen. & Sp. 1: 107. 1816.

Plants perennial, often forming colonies, 1–2 meters high, the nodes densely hispid; blades mostly 2.5–3.5 cm. wide, scabrous on the margins and upper surface; panicles 10–30 cm. long, dense; awns 2–10 mm. long.

Loreto: Iquitos, *Williams 8247.* Ranging to Argentina, Mexico, and the West Indies. "Gamalote."

85. SETARIA Beauv.

Annuals or perennials; panicles very dense and spike-like, or sometimes loose and open; spikelets subtended by 1–several bristles, falling free from the bristles, awnless; first glume broad, usually less than half the length of the spikelet, 3–5-nerved; second glume and sterile lemma equal, or the lemma longer, several-nerved; fertile lemma coriaceous, indurate, smooth or rugose.

Bristles below only the terminal spikelets of each branchlet, the bristles few and inconspicuous; blades plaited . . . . *S. Poiretiana.*

Bristles below all the spikelets, conspicuous; blades not plaited.

Bristles below each spikelet numerous, at least more than 5. *S. geniculata.*

Bristles below each spikelet 1 or, by abortion of the spikelets, 2–3.

Bristles antrorsely scabrous.....*S. vulpiseta.*
Bristles retrorsely scabrous.
Spikelets 2 mm. long.....*S. verticillata.*
Spikelets only 1.5 mm. long.
Panicles usually green, rarely as much as 8 cm. long; bristles 2–3 mm. long.....*S. scandens.*
Panicles commonly purple, up to 15 cm. long; bristles about 10 mm. long.....*S. tenacissima.*

Setaria geniculata (Lam.) Beauv. Ess. Agrost. 51, 178. 1812. *Panicum geniculatum* Lam. Encycl. 4: 727. 1798. *Chaetochloa geniculata* Millsp. & Chase, Field Mus. Bot. 3: 37. 1903.

Plants densely tufted, usually 60 cm. high or less, the culms erect, geniculate at the base; blades 5–8 mm. wide; panicles very dense and spike-like, cylindric, yellow or purplish, 5–10 cm. long, 6–8 mm. thick.

Cuzco: Cuzco, *Hitchcock 22509.*—Junín: Huancayo, 3,400 meters, *Ledig 43.* Chanchamayo Valley, *Schunke 237a.*—Lima: Matucana, edge of alfalfa field, 2,400 meters, *289.*—San Martín: Tarapoto, *Williams 6118, 5394, 5590.* General in tropical America. "Grama chilcua."

This is one of the two or three most abundant weedy grasses of the lowlands of tropical America.

Setaria Poiretiana (Schult.) Kunth, Rev. Gram. 1: 47. 1829. *Panicum elongatum* Poir. in Lam. Encycl. Suppl. 4: 278. 1816, non Salisb. 1796. *P. Poiretianum* Schult. Mant. 2: 229. 1824. *Chaetochloa Poiretiana* Hitchc. Contr. U. S. Nat. Herb. 22: 159. 1920.

Plants tall, cespitose, the culms and sheaths compressed; blades thin, strongly plaited, about 50 cm. long and 5 cm. wide; panicles elongate and narrow, the slender bristles several times as long as the spikelets.

Cuzco: Santa Ana, *Cook & Gilbert 1429, 1523.*—Junín: Colonia Perené, *Hitchcock 22095.*—Loreto: La Victoria, edge of forest, *Williams 2894.* Iquitos, *Williams 6932, 8192.*—San Martín: San Roque, edge of path, *Williams 7132.* Tarapoto, *Williams 6715, 6622.* Bolivia to Brazil and Mexico. "Huayhuash chupa."

Setaria scandens Schrad. ex Schult. Mant. 2: 279. 1824. *Chaetochloa scandens* Scribn. & Merr. U. S. Dept. Agr. Div. Agrost. Bull. 21: 17. 1900.

Plants much branched at the geniculate lower nodes, the slender culms commonly 20–50 cm. long; blades thin, sparsely pilose; panicles slender, 2–8 cm. long, 4–5 mm. thick, interrupted below, pulling from the sheaths at maturity; bristles ascending, 2–3 mm. longer than the spikelets.

Junín: Between Tarma and La Merced, *Hitchcock 22158*. Ranging to Paraguay, the West Indies, and Central America.

Setaria tenacissima Schrad. ex Schult. Mant. 2: 279. 1824. *Chaetochloa tenacissima* Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 352. 1917.

Culms 1 meter high or more, slender, leaning or clambering, blades long and narrow, very scabrous; panicles 10–15 cm. long; bristles slender and divaricate, like the spikelets nearly black at maturity.

A single collection, without locality, is reported from Peru: *Mathews 2105*. The species extends from Bolivia to Brazil and Guatemala.

Setaria verticillata (L.) Beauv. Ess. Agrost. 51. 1812. *Panicum verticillatum* L. Sp. Pl. ed. 2. 1: 1762. *Chaetochloa verticillata* Scribn. U. S. Dept. Agr. Div. Agrost. Bull. 4: 39. 1897.

Culms slender and compressed, geniculate and branched at the base; blades thin, lance-linear; spikes short, green or purplish, with slender bristles.

Lima: Lima, *Mathews 429*. A native of the Old World, naturalized in some localities of America.

Setaria vulpiseta (Lam.) R. & S. Syst. Veg. 2: 495. 1817. *Panicum vulpisetum* Lam. Encycl. 4: 735. 1798. *Chaetochloa vulpiseta* Hitchc. & Chase, Contr. U. S. Nat. Herb. 18: 350. 1917.

Plants large and coarse, 1–2 meters high, forming dense clumps, the culms strongly compressed; blades thin, about 50 cm. long and 3 cm. wide, tapering into a long petiole-like base; panicle bristly, 20–30 cm. long, 2.5 cm. thick, tapering at each end.

Cuzco: Santa Ana, *Cook & Gilbert 1548*.—Junín: Colonia Perené, *Hitchcock 22094*.—Loreto: Edge of forest, Yurimaguas, *Williams 4689*. Tarapoto, in pastures and cultivated land, *Williams 5779, 5600*. Paraguay to the West Indies and Central America. "Huayhuash chupa."

86. PENNISETUM L. Rich.

Annuals or perennials; blades elongate and usually flat; panicles dense, narrow, and spike-like; spikelets solitary or in groups of 2–3, surrounded by an involucre of bristles, these not united except at the very base, often plumose, falling attached to the spikelets; first glume shorter than the spikelet, sometimes minute or absent; second glume equaling or shorter than the sterile lemma; fertile lemma chartaceous, smooth, the thin margin enclosing the palea.

Plants annual..... *P. annuum.*

Plants perennial.

Plants low and creeping, forming dense mats.....*P. clandestinum.*

Plants tall, erect or at least not creeping.

Panicles terminal on the primary culm and leafy branches only, more than 10 cm. long. Bristles soft and silky. *P. peruvianum.*

Panicles terminal and axillary, the axillary on slender naked peduncles, 1–several from a sheath, the axillary ones sometimes wanting in *P. rupestre.*

Panicles few, bristly, rather stiff and dense.....*P. rupestre.*

Panicles several or numerous, if dense, the bristles fine and more or less flexuous.

Bristles numerous, most of them much longer than the spikelet, one longer than the rest but not conspicuously so.....*P. bambusiforme.*

Bristles several, most of them not much longer than the spikelet, one of them (except in *P. intectum*) conspicuously longer than the others.

Blades 2.5–5 cm. wide; spikelets about 5 mm. long. *P. latifolium.*

Blades 1.5 cm. wide or narrower; spikelets 6 mm. long or more.

Spikelets 7–8 mm. long; one bristle not conspicuously longer than the others.....*P. intectum.*

Spikelets 6 mm. long; one bristle conspicuously longer than the others.....*P. Weberbaueri.*

Pennisetum annuum Mez, Bot. Jahrb. 56: Beibl. 125: 7. 1921.

Plants weak, sparing branched, 1 meter high or less; blades flat, scabrous, 6–20 cm. long, 5–10 mm. wide; panicles pale, terminal

and axillary, 2.5–3 cm. long, on slender peduncles; fascicles with numerous fine bristles shorter than the single spikelet, and with one falcate purplish bristle 1.5–2 cm. long.

Lima: Mountains near Chosica, 1,700 meters, *Weberbauer 5354*, type collection. Matucana, among granitic rocks on steep slope, 2,400 meters, *280*.

Pennisetum bambusiforme (Fourn.) Hemsl. Biol. Centr. Amer. Bot. 3: 507. 1885. *Gymnothrix bambusiformis* Fourn. Mex. Pl. 2: 48. 1886.

A tall robust perennial, sometimes 2 meters high; blades flat, long and narrow; panicles 10 cm. long or more; one of the bristles about twice as long as the others.

Cuzco: Santa Ana, *Cook & Gilbert 1632*.—Junín: Tarma, *Hitchcock 22149*. Extending to southern Mexico.

Pennisetum clandestinum Hochst. ex Chiov. Annuar. Ist. Bot. Roma 8: 41. 1903.

A stoloniferous perennial, forming a dense sod; blades short, flat, sparsely pilose; panicles small, terminal, few-flowered, wholly or partly enclosed in the sheaths.

Arequipa: Arequipa, *Hitchcock 22439*.—Puno: Chuquibambilla, *Hitchcock 22449*. A native of Africa, introduced for forage. "Kikuyu grass."

Regarding this grass the following notes have been published by Hitchcock: "At Arequipa the Kikuyu grass was growing in a pasture, where it formed in the dry season a dense short sod. Here and there stamens could be seen arising from flowers hidden in the leaves. The filaments were erect, very slender, and 2–3 cm. long. In other flowers the long styles arose, but were not so conspicuous as the stamens. I was informed that in the rainy season the stems rose to a height of 1 meter."

Pennisetum intectum Chase, Contr. U. S. Nat. Herb. 24: 485. 1927.

Culms solitary or few together, suberect, 1.5 meters high or less; blades flat, 5–10 mm. wide, scaberulous; panicles drooping, 4–6 cm. long, grayish green.

Cuzco: Calca, 3,000 meters, *Herrera 2075*. Also in Ecuador.

Pennisetum latifolium Spreng. Syst. Veg. 1: 302. 1825. *P. Lechleri* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen.

Plants tall and coarse; blades more or less scabrous on both surfaces; panicles 4–10 cm. long, greenish, most of the bristles not exceeding the spikelets, one of them about twice as long.

Puno: Tabina, *Lechler 1925*, type of *P. Lechleri*. Ranging to Brazil and Uruguay.

Pennisetum peruvianum Trin. Linnaea 10: 295. 1836. *Gymnothrix peruviana* Doell in Mart. Fl. Bras. 2, pt. 1: 302. 1877.

Plants robust, branched, erect or leaning, 2–3 meters high; blades flat, elongate, 4–6 cm. wide, tapering to each end, scabrous above, smooth beneath; panicles pale, soft and silky, 15–25 cm. long, 3–5 cm. thick; bristles 2–3 cm. long.

Huánuco: Vilcabamba, 1,800 meters, on sunny slopes, *4982*. San Martín: San Roque, in stream, 1,400 meters, *Williams 7131*. Extending to Ecuador. Type collected by Poeppig in the Andes of Peru.

Pennisetum rupestre Chase, Contr. U. S. Nat. Herb. 24: 484. 1927.

Growing in loose clumps, the culms 75 cm. high or less, branching near the base; blades 5–10 mm. wide, scabrous and sparsely pilose on the upper surface, scaberulous beneath; panicles 2.5–7 cm. long, 1 cm. thick, dense; most of the bristles slightly shorter than the spikelet; spikelets 6 mm. long.

Lima: Matucana, disintegrated rock slope, 2,400 meters, *453*, type. Obrajillo, *Wilkes Exped.*

Pennisetum Weberbaueri Mez, Notizbl. Bot. Gart. Berlin 7: 50. 1917.

Plants rather slender, forming dense clumps 1–2 meters high, rather sparsely branched, the culms and sheaths often tinged with purple; blades 6–15 mm. wide; panicles 5–7 cm. long, often purplish, loosely flowered; most of the bristles slightly longer than the spikelets.

Ayacucho: Huanta, *Pearce* in 1867.—Cuzco: Cuzco, *Hitchcock 22511*.—Junín: Type from Tarma, *Weberbauer 2393*. Tarma, open hillside, 3,000 meters, *Killip & Smith 21788, 21822*.—Lima: Matucana, 2,400 meters, moist bank, *256*.

87. CENCHRUS L. Sandbur

Plants annual or perennial, usually low and much branched from the base; blades flat, narrow; burs in racemes; spikelets solitary

or few together, surrounded and enclosed by a spiny bur composed of numerous coalescent bristles, the bur globular, the peduncle short and thick, jointed at the base; spines barbed.

The grasses of this genus are all too well known because of their pernicious burs, that adhere tenaciously to clothing by their barbed bristles. The spines are so stiff that they readily penetrate the flesh, or even the leather of shoes, and, on account of the barbs on the bristles, it is difficult to remove them.

Plants perennial; involucral lobes united only at the base. Spikes dense and relatively slender.....*C. myosuroides.*

Plants annual; involucral lobes united above the base.

Involucre with flattened spreading spines, and with no ring of slender bristles at the base.

Burs short-pubescent.....*C. pauciflorus.*

Burs densely villous.....*C. humilis.*

Involucre with a ring of slender bristles at the base.

Bristles antrorsely scabrous.....*C. pilosus.*

Bristles retrorsely barbed.

Burs, excluding the bristles, not more than 4 mm. wide, numerous, crowded in a long spike; lobes of the involucre interlocking, not spine-like.....*C. viridis.*

Burs 5–7 mm. wide, not densely crowded; lobes of the involucre erect or nearly so, rarely 1–2 of them interlocking, the tips spine-like.....*C. Hillebrandianus.*

Cenchrus Hillebrandianus Hitchc. Mem. Bishop Mus. 8: 211. *f. 106.* 1922.

Culms ascending from a decumbent base, branched below; blades flat and thin, elongate, 5–10 mm. wide, pilose like the sheaths; spikes mostly 5–7 cm. long.

Junín: La Merced, *Hitchcock 22133.* Colonia Perené, *Hitchcock 22081.*—Lima: Chosica, in old banana plantation, 900 meters, *549.* Callao, *Didrichsen 4393*: Lima, *Ball* in 1882. Also in Hawaii.

Macbride 549 was referred by Hitchcock (Contr. U. S. Nat. Herb. 24: 488. 1927) to *C. echinatus* L., but the sheet of specimens in the herbarium of Field Museum, determined by that author, shows a plant that is densely pubescent, and therefore referable rather to *C. Hillebrandianus.* However, it is probable that the latter is nothing more than a pubescent form or variety of *C. echinatus,* a widely distributed, weedy grass.

Cenchrus humilis Hitchc. Contr. U. S. Nat. Herb. 24: 488. 1927.

Annual, the culms branched from the base, only 2–10 cm. long; sheaths puberulent and pilose; blades 2–5 cm. long, 1–2 mm. wide, glabrous; inflorescence of 1–6 burs, these 3 mm. wide, villous.

Arequipa: Mollendo, on dry sand, *Hitchcock 22349*, type; *Weberbauer 1490*.

Cenchrus myosuroides HBK. Nov. Gen. & Sp. 1: 115. *pl. 35*. 1816.

Plants glabrous, rather stout, sometimes 2 meters tall; blades about 5 mm. wide; spikes cylindric, 12–20 cm. long, 8 mm. thick, the erect bristles not exceeding the spikelet.

Lima: Chosica, in neglected banana plantation, 900 meters, *540*. Callao, *Cuming 1063*. Widely distributed in North and South America.

Cenchrus pauciflorus Benth. Bot. Voy. Sulph. 56. 1840.

Plants decumbent, often much branched from the base, the flowering culms ascending; sheaths loose; blades firm, usually folded; spikes shortly exserted, with 6–12 burs.

Junín: La Merced, *Hitchcock 22134*. Colonia Perené, *Hitchcock 22110*. Ranging from Argentina to the United States.

Cenchrus pilosus HBK. Nov. Gen. & Sp. 1: 116. *pl. 36*. 1816.

Plants stout, commonly decumbent and rooting at the lower nodes; blades short or elongate, 5–9 mm. wide, glabrous; spikes dense, only partly exserted from the sheaths; inner bristles twice as long as the body of the bur.

Piura: Pariñas Valley, *Haught 168*. Near Piura, growing along watercourses after rains, *Haught F76*. Ranging to Venezuela and Mexico. "Abrojo."

Cenchrus viridis Spreng. Syst. Veg. 1: 301. 1825.

Plants tall and slender, the blades elongate, glabrous, about 1 cm. wide; spikes very dense, with very numerous small burs, often 10 cm. long.

Loreto: Iquitos, a common grass, *Williams 8073*. Puerto Arturo, Yurimaguas, *Williams 5005*.—San Martín: Tarapoto, 750 meters, *Williams 5464*. Generally distributed in tropical America; one of the common weedy grasses of the lowlands.

88. OLYRA L.

Erect or clambering perennials with broad flat blades, monoecious, the inflorescence paniculate; pistillate spikelets borne on the upper branchlets and on the ends of the lower branches of the panicle, the smaller staminate spikelets pedicellate along the lower branches; pistillate spikelets large, the first glume wanting; second glume and sterile lemma herbaceous, caudate-acuminate; fruit bony-indurate; staminate spikelets easily deciduous, the glumes and sterile lemma wanting, the lemma and palea membranaceous.

Blades small, mostly 3–4 cm. long and 5–10 mm. wide; panicles few-flowered, open, 3 cm. long or less; pistillate spikelets less than 3 mm. long ..... *O. lateralis.*

Blades much larger, more than 10 cm. long; panicles usually large, and 10 cm. long or more; pistillate spikelets more than 5 mm. long.

Panicles small, narrow and spike-like, more or less appressed. Fruit pubescent ..... *O. surinamensis.*

Panicles mostly ovoid, not spike-like or appressed.

Fruit pubescent ..... *O. loretensis.*

Fruit glabrous.

Fruit conspicuously pitted, about 3 mm. long... *O. micrantha.*

Fruit not pitted or only obscurely so, much larger.

Blades ovate-cordate, the uppermost often 7 cm. wide. *O. cordifolia.*

Blades oblong, rounded or narrowed at the base, not evidently cordate.

Spikelets in a narrow or open panicle, the branches not subdigitate ..... *O. latifolia.*

Spikelets short-pediceled along the subdigitate main branches of the panicle, the numerous staminate ones below, a few pistillate toward the end, the branches 10 cm. long or more.

Staminate spikelets 7–10 mm. long; fruit obscurely pitted ..... *O. Heliconia.*

Staminate spikelets 4–5 mm. long; fruit not pitted. *O. caudata.*

Olyra caudata Trin. Linnaea 10: 292. 1836.

Plants erect, 1.5–2 meters high; blades oblong, 20–30 cm. long, 7–8 cm. wide, long-acuminate, glabrous; branches of the panicle

long and slender, the pistillate spikelets solitary at the ends; glumes extended into a slender awn as much as 3.5 cm. long; fruit white and smooth.

Loreto: Yurimaguas, 135 meters, in forest, *Killip & Smith 27975*.—San Martín: Type from Tocache, *Poeppig*. Extending to the Guianas.

Olyra cordifolia HBK. Nov. Gen. & Sp. 1: 198. 1816.

Plants erect, 1–2 meters high; blades glabrous, mostly 17–20 cm. long, broad, with a long narrow tip; panicles mostly 10–15 cm. long; fruit 4–5 mm. long, white, not pitted.

Loreto: Yurimaguas, 135 meters, in forest, *Killip & Smith 27560*. Paraguay to the Guianas and Colombia.

Olyra Heliconia Lindm. Svensk. Vet. Akad. Handl. 34, No. 6: 11. *pl. 6*. 1900.

Plants stout, 1–3 meters high; blades strongly asymmetric, up to 30 cm. long and 8 cm. wide, glabrous, branches of the inflorescence aggregate in 1–2 whorls, slender, sometimes 20 cm. long; staminate spikelets often purplish, 1 cm. long; pistillate spikelets usually 3–4 near the ends of the branches.

Cuzco: Santa Ana, *Cook & Gilbert 1653*.—Huánuco: Pozuzo, 600 meters, *4572*.—Junín: La Merced, 700 meters, in thickets, *Killip & Smith 23788*.—San Martín: Lamas, *Spruce 4807; Williams 6449*. San Roque, in forest, 1,400 meters, *Williams 7792*. Brazil and Bolivia. "Pingullu-shucush."

Olyra lateralis (Presl) Chase, Proc. Biol. Soc. Wash. 21: 179. 1908. *Panicum laterale* Presl, Rel. Haenk. 1: 305. 1830.

A vine-like, straggling or pendent perennial, much more slender than the other species; blades lance-oblong, glaucous beneath; panicles about as broad as long, rather delicate; staminate spikelets linear, 3–4 mm. long; pistillate spikelets ovoid, 2–3 mm. long.

Huánuco: Type from the mountains of Huánuco, *Haenke*. Vilcabamba, 1,800 meters, pendent from edge of clay banks, *4990*. —San Martín: San Roque, 1,400 meters, *Williams 7111*.—Department unknown: *Poeppig 976*. Bolivia to Costa Rica.

Olyra latifolia L. Syst. Nat. ed. 10. 2: 1261. 1759.

Plants erect, sometimes 5 meters high, somewhat suggesting a bamboo; blades asymmetric, lance-oblong, about 20 cm. long and

5 cm. wide, long-pointed, glabrous; panicles ovoid, 10–15 cm. long, each branch bearing a single pistillate spikelet at the summit.

Ayacucho: Near Kimpitiriki, 400 meters, in forest, *Killip & Smith 22985*.—Junín: La Merced, 1,200 meters, *5685, 5521*. Río Paucartambo Valley, 700 meters, dense forest, *Killip & Smith 25330*.—Loreto: Near Iquitos, *Williams 1526*. Punchana, near Iquitos, in forest, *Williams 3752*. Yurimaguas, edge of forest, *Williams 3802, 7860*. Fortaleza, Yurimaguas, in forest, *Williams 4375*.—San Martín: San Roque, 1,400 meters, *Williams 7682*. Tarapoto, *Williams 5873, 5824, 5491, 6122*. Lamas, 840 meters, *Williams 6465*. General in tropical America. "Carrizo."

Olyra loretensis Mez, Notizbl. Bot. Gart. Berlin 7: 47. 1917.

Leaves like those of *O. latifolia*, glabrous; panicles about 13 cm. long, much branched and rather dense, the branches very slender; pistillate spikelets 15 mm. long; staminate spikelets minute, 2 mm. long.

Loreto: Type from Leticia, *Ule 6224*. La Victoria, in forest, *Williams 3001*.

Olyra micrantha HBK. Nov. Gen. & Sp. 1: 199. 1816.

Plants stout, suberect, sometimes 3–5 meters high; blades often 30 cm. long, pale beneath, rounded at the base, long-acuminate, glabrous; panicles dense, 30 cm. long or less; fruit pitted, 3 mm. long.

Junín: Chanchamayo Valley, 1,500 meters, *Schunke 631, 255, 393*.—Puno: Sangabán, *Lechler 3235, 3305*. Paraguay to Colombia.

Olyra surinamensis Hochst. ex Steud. Syn. Pl. Glum. 1: 36. 1854.

Plants tall and coarse, similar to *P. latifolia;* panicles numerous, axillary, narrow, few-flowered, appressed; pistillate spikelets much narrower than in *O. latifolia;* fruit pubescent.

Loreto: Timbuchi on Río Nanay, in water in forest, *Williams 1043*. Also in the Guianas.

89. LITHACHNE Beauv.

Slender monoecious perennials with wiry culms and broad flat blades; spikelets in axillary panicles, these with a pistillate spikelet at the summit and 1–several staminate spikelets below; terminal panicle, if present, wholly staminate; first glume of pistillate spikelet wanting; second glume and sterile lemma herbaceous, long-

acuminate; fruit bone-like, whitish, somewhat compressed laterally, the lemma greatly swollen or gibbous on the back; staminate spikelets reduced to the lemma and palea.

Lithachne pauciflora (Sw.) Beauv. ex Poir. Dict. Sci. Nat. 27: 60. 1823. *Olyra pauciflora* Sw. Prodr. Veg. Ind. Occ. 21. 1788.

Culms very slender, forming dense or loose clumps, geniculate and naked below, leafy above, 20–50 cm. high; blades commonly 4–8 cm. long, acuminate, green, asymmetric, spreading; fruit white, 4–5 mm. long.

San Martín: Tarapoto, 750 meters, *Williams 5518*. Argentina to Mexico and the West Indies.

90. IMPERATA Cyrillo

Slender erect perennials with long narrow blades; panicles terminal, narrow, silky; spikelets all alike, not awned, in pairs, unequally pediceled on a slender continuous rachis, surrounded by long silky hairs; glumes subequal, membranaceous; lemmas and palea thin and hyaline.

Blades involute.....*I. tenuis.*

Blades flat.

Spikelets 3 mm. long.....*I. contracta.*

Spikelets 2 mm. long.....*I. minutiflora.*

Imperata contracta (HBK.) Hitchc. Rept. Mo. Bot. Gard. 4: 146. 1893. *Saccharum contractum* HBK. Nov. Gen. & Sp. 1: 182. 1816.

Plants erect, forming clumps, with scaly rhizomes; culms simple, leafy, 1–1.5 meters high; blades flat, 5–10 mm. wide; panicles pale, 40 cm. long or less.

Cuzco: Santa Ana, *Cook & Gilbert 1533*. Brazil to Mexico and the West Indies.

Imperata minutiflora Hack. in DC. Monogr. Phan. 6: 100. 1889.

Similar to *I. contracta*, but the blades narrower; spikelets smaller, only 2 mm. long.

Known in Peru only from the vicinity of Lima, where the type was collected by Gaudichaud. Also in Bolivia.

Imperata tenuis Hack. in DC. Monogr. Phan. 6: 689. 1889. *I. exaltata* var. *angustifolia* Hack. op. cit. 99. 1889.

Perennial, tall, stout, cespitose; blades firm, stiff, involute; panicles dense, silvery, 15–20 cm. long.

San Martín: Tarapoto, *Spruce 4224*. Bolivia to Paraguay and Brazil.

91. SACCHARUM L.

Tall perennials with plume-like panicles; spikelets in pairs, one sessile, the other pediceled, both perfect, awnless, the axis disjointing below the spikelets; glumes somewhat indurate; sterile lemma similar but hyaline; fertile lemma hyaline, sometimes wanting.

Saccharum officinarum L. Sp. Pl. 54. 1753.

A giant perennial, several meters high, the overlapping sheaths falling from the short-jointed lower part of the culm; panicles very large, pinkish and silvery. "Caña de azúcar." "Sugar cane."

Loreto: La Victoria, *Williams 2817*. Native of the Old World tropics, but cultivated generally in the warmer parts of America.

Sugar cane is grown generally in Peru, wherever climatic conditions are suitable for its cultivation, that is, at lower elevations.

92. ANDROPOGON L.

Plants usually coarse perennials with solid culms; spikelets arranged in racemes, these numerous and aggregate on an exserted peduncle, or single, in pairs, or sometimes in 3's or 4's, the common peduncle enclosed in a spathe-like sheath; spikelets in pairs at each node of a jointed rachis, one sessile and perfect, the other pedicellate and either staminate, neuter, or reduced to the pedicel, the rachis and pedicels of the sterile spikelet often villous; glumes of the fertile spikelet coriaceous, narrow, awnless; lemmas hyaline, the fertile usually bearing a bent and twisted awn from the apex or between the apical lobes; pedicellate spikelet not awned.

Racemes solitary, terminating the culms and branches; rachis joints clavate, the summit with a cuplike hollow.

Plants annual, the culms weak and decumbent.....*A. brevifolius.*

Plants perennial, the culms tall and relatively stout.

Rachis of the racemes flexuous, very slender, the spikelets spreading.....*A. condensatus.*

Rachis straight, the spikelets appressed or ascending.

First glume of the sessile spikelet villous.....*A. hirtiflorus.*

First glume of the sessile spikelet glabrous or nearly so. *A. cirratus.*

Racemes 2 or more together at the ends of the culms and branches; rachis joints not clavate with hollowed summits.

Racemes numerous or several along an axis, forming an exserted panicle.....*A. saccharoides.*

Racemes 2–4, rarely 5–6, fascicled at the ends of slender branches, subtended by a bladeless sheath, exserted or partly included.

Spikelets awnless.

Plants robust, 1–2 meters high; spathes aggregate in a corymbose and usually dense inflorescence.....*A. bicornis.*

Plants slender, commonly less than 1 meter high; spathes not aggregate.

Sessile spikelets about 3 mm. long; blades usually not more than 2 mm. wide, acuminate.....*A. leucostachyus.*

Sessile spikelets about 4 mm. long; blades 3–5 mm. wide, the apex boat-shaped.....*A. Selloanus.*

Spikelets awned.

Sessile spikelet 4–5 mm. long.....*A. lateralis.*

Sessile spikelet 6 mm. long.....*A. flavescens.*

Andropogon bicornis L. Sp. Pl. 1046. 1753.

Plants robust, forming dense clumps; blades long and narrow, scabrous on the margins; inflorescence large and feathery, corymbose, composed of delicate racemes; one and sometimes two of the uppermost pediceled spikelets larger than the fertile ones, the other pediceled spikelets rudimentary.

Junín: Colonia Perené, *Hitchcock 22051.*—Loreto: Iquitos, dry loam, *Williams 1457, 7992, 83.* Fortaleza, Yurimaguas, in pasture, *Williams 4234.* Paraguay to southern Mexico.

Andropogon brevifolius Sw. Prodr. Veg. Ind. Occ. 26. 1788.

Plants slender, trailing or reclining, glabrous, much branched; blades short, flat, obtuse; racemes delicate, with small spikelets, the awns 8 mm. long.

Junín: Colonia Perené, *Hitchcock 22113.* Tropical regions of both hemispheres.

Andropogon cirratus Hack. Flora 68: 119. 1885.

Plants tall and slender, 1 meter high or less; blades long and narrow, flat; racemes erect, short-villous; awns twisted, about 1 cm. long.

Cuzco: Ollantaitambo, *Hitchcock 22526*.—Huánuco: Open slope, 2,700 meters, *1423*. Also in Ecuador; Mexico and the southwestern United States.

Andropogon condensatus HBK. Nov. Gen. & Sp. 1: 188. 1816. *A. Lechleri* Steud. ex Hack. in Mart. Fl. Bras. 2, pt. 3: 297. 1883.

Plants tall and coarse, the culms compressed, repeatedly branching toward the summit and forming a large corymbose mass of racemes; rachises long and flexuous; awns delicate, 12 mm. long.

Cuzco: Valle de San Miguel, 2,400 meters, *Herrera 2016*.—Huánuco: Huánuco, 2,100 meters, old field, *3518*.—Junín: Colonia Perené, *Hitchcock 22077*. Quebrada of Pariahuanca, *Mathews 935*.—Puno: Tabina, *Lechler 1860*, type of *A. Lechleri*.—Without locality: *Poeppig 966*. Argentina to Mexico and the West Indies.

Andropogon flavescens Presl, Rel. Haenk. 1: 339. 1830.

Plants tall and coarse, with elongate flat blades, fulvous-pubescent; inflorescences few to several, exserted.

Huánuco: Type collected by Haenke. The species is unknown otherwise, and its status is somewhat uncertain.

Andropogon hirtiflorus (Nees) Kunth, Rév. Gram. 2: 569. 1832. *Schizachyrium hirtiflorum* Nees, Agrost. Bras. 334. 1829. *A. tabina* Steud. ex Lechl. Berb. Amer. Austr. 56. 1857, nomen. *S. Weberbaueri* Pilger, Notizbl. Bot. Gart. Berlin 8: 452. 1923. *S. Weberbaueri* var. *minus* Pilger, op. cit. 453. 1923.

Plants tall and slender, forming dense clumps, the stems compressed; blades long and narrow, flat; racemes erect, short-villous; awns twisted, 1 cm. long.

Ancash: Caraz, *Weberbauer 3017*, type of *S. Weberbaueri*.—Cajamarca: Prov. Hualgayoc, *Weberbauer 3949*, type of *S. Weberbaueri* var. *minus*.—Huánuco: Mito, 2,700 meters, *3325*.—Junín: Tarma, *Weberbauer 2384; Hitchcock 22147*.—Lima: Río Blanco, rocky canyon slope, 3,600 meters, *994*.—Puno: Tabina, *Lechler 1930*, type of *A. tabina*. Paraguay to the West Indies and Florida.

Andropogon lateralis Nees, Agrost. Bras. 329, 1829.

Plants coarse, tall, erect, purplish, 1 meter high or less; blades flat, 3–6 mm. wide; inflorescences few to several, exserted, composed of 2–4 racemes 3–4 cm. long; joints and sterile pedicel villous; sessile spikelet 4–5 mm. long, purplish, the awn 1 cm. long.

Junín: Tarma, *Hitchcock 22143*. Ranging to Brazil and Uruguay.

Andropogon lateralis Nees, var. **incanus** (Hack.) Henr. Med. Rijks Herb. 40: 42. 1921. *A. incanus* Hack. in DC. Monogr. Phan. 6: 431. 1889.

Differing from the typical form in having usually 2, somewhat longer, tawny, and more villous racemes.

Huánuco: Mito, grassy slopes and sunny cliffs, 2,700 meters, *1499, 1611, 3323.*—Junín: Tarma, *Hitchcock 22156.* Ecuador to Brazil and Uruguay.

Andropogon leucostachyus HBK. Nov. Gen. & Sp. 1: 187. 1816.

Plants slender, densely tufted, erect; blades long and narrow, with deeply impressed midvein; racemes 2–3, on slender exserted peduncles; spikelets hidden by the copious long soft silky hairs.

Amazonas: Chachapoyas, in pasture, 2,700 meters, *Williams 7540.* Uruguay to Mexico and the West Indies.

Andropogon saccharoides Sw. Prodr. Veg. Ind. Occ. 26. 1788.

Plants tall, erect, unbranched, the culms brittle; blades long and flat; panicle pale, silky, composed of numerous racemes; awns delicate, 1.5–2 cm. long; nodes bearded with stiff white hairs; sessile spikelets 5 mm. long.

A species widely distributed in America, represented in Peru by the following varieties.

Andropogon saccharoides Sw. var. **laguroides** (DC.) Hack. in Mart. Fl. Bras. 2, pt. 3: 293. 1883. *A. laguroides* DC. Cat. Hort. Monsp. 78. 1813.

Nodes glabrous; culms usually lower and less robust, the panicles smaller than in the typical form.

San Martín: Río Mayo, *Spruce 4854.* Ranging as widely as the species.

Andropogon saccharoides Sw. var. **parvispiculus** (Hitchc.) Standl. Field Mus. Bot. 8: 297. 1931. *A. saccharoides* subsp. *parvispiculus* Hitchc. Contr. U. S. Nat. Herb. 24: 497. 1927.

Differing from the typical form in having a longer, gray or purplish panicle, the spikelets smaller, 3–4 mm. long; blades pubescent or glabrous.

Cuzco: Cuzco, *Hitchcock 22499.*—Huánuco: Huánuco, *Haenke.*—Junín: Tarma, *Hitchcock 22166.*—Lima: Lima, *Wilkes Exped.* Ranging to Brazil and Argentina.

Andropogon saccharoides Sw. var. **perforatus** (Trin.) Hack. in DC. Monogr. Phan. 6: 496. 1889. *A. perforatus* Trin. ex Fourn. Mex. Pl. 2: 59. 1886.

First glume with a small pit or depression on the back above the middle; otherwise like the typical form.

Junín: Tarma, *Hitchcock 22166½*.—Lima: Matucana, 2,400 meters, loose gravelly soil of gulches, *255*. Callao, *Wilkes Exped.*—Puno: Tabina, *Lechler 1952*. Argentina to Texas.

Andropogon Selloanus Hack. Bull. Herb. Boiss. II. 4: 266. 1904. *A. leucostachyus* var. *Selloanus* Hack. in DC. Monogr. Phan. 6: 420. 1889.

Plants tall, rather stout, the blades bright green, flat, mostly 3–4 mm. wide, with an obtuse tip; racemes often 5–6, soft and silky, pale brownish.

Cajamarca: Río Tabaconas, 1,000 meters, *Weberbauer 6150*.—Junín: Colonia Perené, *Hitchcock 22096*.—San Martín: Tarapoto, 750 meters, *Williams 5895, 5834*. Paraguay to the West Indies.

93. HYPARRHENIA Fourn.

Tall perennials; pairs of racemes and their spathes more or less crowded, forming a large inflorescence at the upper part of the plant; spikelets in pairs, the spikelets of the lower pairs alike, sterile and awnless; fertile spikelets 1–few in each raceme, terete or flattened on the back, the margins of the first glume rounded, the base usually elongate into a sharp callus, the fertile lemma with a strong geniculate awn; sterile spikelets not awned.

Hyparrhenia bracteata (H. & B.) Stapf in Prain, Fl. Trop. Afr. 9: 360. 1918. *Andropogon bracteatus* H. & B. ex Willd. Sp. Pl. 4: 914. 1806. *Anthistria pilosa* Presl, Rel. Haenk. 1: 348. 1830.

Erect, 1 meter high or more; sheaths somewhat hispid, especially near the summit, the blades long and narrow, appressed-hispid beneath; inflorescence narrow, brown, usually 30 cm. long or more; bracts narrow, 1–2 cm. long; racemes few-flowered, mostly less than 1 cm. long; awns about 2 cm. long.

Cuzco: Santa Ana, *Cook & Gilbert 1638*. Brazil to southern Mexico.

94. CYMBOPOGON Spreng.

Perennial, aromatic, densely tufted plants; racemes in pairs subtended by spathes and collected in a decompound inflorescence; spikelets in pairs as in *Andropogon*, but the lowest pair of one or

both racemes sterile; fertile spikelets compressed; fertile lemma narrow, awned between 2 teeth or lobes.

Cymbopogon citratus (DC.) Stapf, Kew Bull. 1906: 322. 1906. *Andropogon citratus* DC. Cat. Hort. Monsp. 78. 1813.

A coarse glabrous perennial, forming dense clumps; blades 5–15 mm. wide, scabrous on the margins; inflorescence 30–60 cm. long, nodding.

Cuzco: Santa Ana, *Cook & Gilbert 1529.*—Loreto: Santa Ana on the Río Nanay, *Williams 1253.* A native of the Old World, but cultivated and naturalized in the American tropics. "Yerba Luisa."

In America this grass does not flower, but it may be recognized easily by its lemon-scented leaves. From them there is obtained in India an aromatic oil called lemon oil. In tropical America lemon grass is planted chiefly for its supposed medicinal properties, and a tea prepared from the leaves is employed in treating numerous affections.

95. **SORGHUM** Moench

Annuals or perennials, usually tall, with flat and often broad blades; panicles composed of 1–5 jointed but tardily disarticulating racemes; spikelets in pairs, one sessile and fertile, the other pediceled, sterile but well developed, usually staminate, the terminal sessile spikelet with 2 pediceled spikelets.

Plants perennial, with creeping rhizomes.....*S. halepense.*
Plants annual.....*S. vulgare.*

Sorghum halepense (L.) Pers. Syn. Pl. 1: 101. 1805. *Holcus halepensis* L. Sp. Pl. 1047. 1753. *Andropogon halepensis* Brot. Fl. Lusit. 1: 89. 1804.

Plants coarse, 1–1.5 meters high, with numerous stout rhizomes; blades commonly 1.5 cm. wide or less, with prominent midrib, the edges white and scabrous; panicle 15–25 cm. long; fertile spikelets 5 mm. long, awned or awnless, the awn 7–10 mm. long, deciduous; staminate spikelets 4 mm. long, the pedicel 3 mm. long.

Cuzco: Santa Ana, *Cook & Gilbert 1428.*—Lima: Lima, *Hitchcock 22347.* Native of the Old World but naturalized in many parts of America. "Johnson grass."

In the United States Johnson grass often becomes a pernicious and troublesome weed, difficult of eradication. In some regions, however, it is valued as a forage grass.

Sorghum vulgare Pers. Syn. Pl. 1: 101. 1805. *Holcus Sorghum* L. Sp. Pl. 1047. 1753.

A tall coarse annual, in habit somewhat resembling maize, with very broad blades; panicle compact or open; spikelets turgid, persistent.

Loreto: Puerto Arturo, Yurimaguas, *Williams 5132.* Lower Río Nanay, *Williams 390.*—San Martín: San Roque, *Williams 7441.* Native of the Old World; cultivated in America and sometimes escaped from cultivation. "Maíz guineo," "escoba." "Sorghum," "broomcorn."

Sorghum in its various varieties is grown in Peru as feed for stock, and for its seeds. One of its varieties is broomcorn, with brush-like panicles whose branches are naked below. Broomcorn is utilized for making brooms, and it may be used for forage like other forms of the species.

96. HETEROPOGON Pers.

Annuals or perennials with flat blades; racemes solitary, terminal on the culms and branches, the rachis slender, the lower part bearing pairs of staminate spikelets, continuous, the upper part disjointing at the base of each node; one spikelet of a pair sessile, the other staminate; perfect spikelets terete, long-awned, the pedicellate spikelets awnless; glumes of the fertile spikelet equal, the first brown-hirsute, infolding the second; fertile lemma extended into a bent and twisted, brown awn.

Plants perennial, less than 1 meter high; outer glumes of the staminate spikelet hispid ..... *H. contortus.*

Plants annual, more than 1 meter high; outer glume of the staminate spikelet with a row of glands along the back, not hispid. *H. melanocarpus.*

Heteropogon contortus (L.) Beauv. ex R. & S. Syst. Veg. 2: 836. 1817. *Andropogon contortus* L. Sp. Pl. 1045. 1753.

Plants erect and tufted, branched, the culms compressed; sheaths keeled; blades scabrous, about 4 mm. wide; racemes one-sided, 3–5 cm. long, the strongly bent, brown awns about 5 cm. long.

Huancavelica: Río San Bernardo, 1,600 meters, *Weberbauer 6575.*—Huánuco: Huánuco, in shale rock crevices, 2,100 meters, *3239.*—Without locality, *Weberbauer 6436.* Widely distributed in the warmer regions of both hemispheres.

Heteropogon melanocarpus (Ell.) Benth. Journ. Linn. Soc. Bot. 19: 71. 1882. *Andropogon melanocarpus* Ell. Bot. S. C. & Ga. 1: 146. 1816.

Plants stout and often glaucous, sometimes 2.5 meters high; blades 1 cm. wide or less; racemes several, crowded in the upper leaves and forming a dense inflorescence 20–30 cm. long.

Huancavelica: Río Mantaro, 1,100 meters, *Weberbauer 6572.*—San Martín: Tarapoto, *Spruce 4180.* Tropical regions of both hemispheres.

97. TRACHYPOGON Nees

Rather tall perennials; racemes terminal, spike-like; spikelets in pairs along a slender continuous rachis, one of them nearly sessile, staminate, awnless, the other pediceled, perfect, long-awned; pedicel of the perfect spikelet disjointing obliquely near the base, forming a sharp barbed callus below the spikelet; first glume firm-membranaceous, rounded on the back, several-nerved, obtuse; second glume firm, obscurely nerved; fertile lemma narrow, extending into a stout, twisted and bent or flexuous awn.

Racemes solitary, rarely 2, on each culm; awn densely soft-pubescent below.....*T. Montufari.*

Racemes 2–3, rarely solitary; awn sparsely plumose below with long hairs.....*T. plumosus.*

Trachypogon Montufari (HBK.) Nees, Agrost. Bras. 342. 1829. *Andropogon Montufari* HBK. Nov. Gen. & Sp. 1: 184. 1816.

Plants slender, 50–100 cm. high; blades narrow, scabrous or glabrous; ligule firm, 1 cm. long or less; racemes slender, dense, long-exserted, 10–15 cm. long; first glume pubescent, obtuse; awn of fertile lemma twice geniculate, 3–5 cm. long.

Huánuco: Mito, 2,700 meters, loose slopes or in swales, *3430, 1447.*—Junín: Tarma, *Hitchcock 22148.*—Department uncertain: *Weberbauer 6267.* Uruguay to Mexico and Arizona.

Trachypogon plumosus (H. & B.) Nees, Agrost. Bras. 344. 1829. *Andropogon plumosus* H. & B. ex Willd. Sp. Pl. 4: 918. 1806.

Plants commonly 1–1.5 meters high; blades elongate, 5–7 mm. wide or narrower; racemes 10–20 cm. long; awns 4–7 cm. long.

Huánuco: Huacachi, 1,950 meters, steep rocky grassland, *4068.*—Junín: San Ramón, 1,000 meters, open hillside, *Killip & Smith 24784.*—Huancavelica: Río San Bernardo, 1,600 meters, *Weberbauer 6576.* Bolivia and Brazil to Mexico.

98. ELYONURUS H. & B.

Erect perennials; racemes solitary, spike-like, often woolly; spikelets in pairs along a somewhat tardily disjointing rachis, the joints and pedicels thickened and parallel, the sessile spikelets appressed to the concave side, the pedicellate spikelet staminate, both awnless, the pair falling with a joint of the rachis; first glume firm, somewhat coriaceous, depressed on the back, a line of balsam glands on the marginal nerves, the apex entire and acute or acuminate, or bifid with aristate teeth; second glume similar to the first; lemmas thin and hyaline.

Elyonurus adustus (Trin.) Ekman, Ark. Bot. 13, No. 10: 6. 1913. *Andropogon adustus* Trin. Mém. Acad. St. Pétersb. VI. Math. Phys. Nat. 2: 259. 1832.

Perennial, slender, 1 meter high or less, densely cespitose and somewhat bulbous at the base; blades slender, erect, elongate; racemes 5–10 cm. long; spikelets villous, 6 mm. long.

San Martín: Tarapoto, *Spruce 4500.* Widely distributed in South America.

99. ROTTBOELLIA L. f.

Slender perennials, the usually numerous, cylindric or flattened spikes solitary on the culms and branches; spikelets awnless, in pairs at the nodes of a thickened jointed rachis, one sessile and fertile, the other pedicellate and sterile, the pedicel thickened and appressed to the rachis; glumes obtuse, the first coriaceous; lemmas and palea thin and hyaline, enclosed in the glumes; pedicellate spikelet reduced and often rudimentary.

Rottboellia fasciculata Lam. Tabl. Encycl. 1: 204. 1791. *Manisuris fasciculata* Hitchc. Amer. Journ. Bot. 2: 299. 1915.

Culms often 1 meter high, ascending from a long-creeping base, compressed and 2-edged; blades flat or folded, glabrous, 10–15 cm. long, 2–5 mm. wide; spikes 3–10 cm. long, compressed.

Lima: Chosica, 900 meters, on river and ditch banks, *553.* Widely distributed in tropical America.

100. HACKELOCHLOA Kuntze

Much-branched annuals with flat blades; spikes numerous, solitary and more or less enclosed in a sheathing bract, the bracts sometimes clustered in the leaf axils; spikelets awnless, in pairs, the rachis joint and pedicel grown together, the two clasped between

the edges of the globose pitted first glume of the sessile spikelet; pedicellate spikelet conspicuous, staminate.—The genus consists of a single species.

Hackelochloa granularis (L.) Kuntze, Rev. Gen. 776. 1891. *Cenchrus granularis* L. Mant. Pl. 575. 1771. *Rytilix granularis* Skeels, U. S. Dept. Agr. Bur. Pl. Ind. Bull. 282: 20. 1913.

Plants coarsely hispid, 1 meter high or less; blades 5–10 mm. wide, mostly less than 10 cm. long; racemes terminal and axillary, 1–2.5 cm. long.

Junín: La Merced, sandy valley floor, 600 meters, *5452*. Colonia Perené, *Hitchcock 22083*. Generally distributed in tropical America; naturalized from the Old World.

This grass may be recognized readily by the deeply pitted spikelets.

101. COIX L. Job's tears.

Tall coarse perennials with broad flat blades, the monoecious inflorescences numerous, on long stout peduncles clustered in the leaf axils; pistillate spikelets 2–3 together, 1 fertile and 1–2 rudimentary, enclosed in a bony bead-like involucre; staminate spikelets approximate in 3's.

Coix Lachryma-jobi L. Sp. Pl. 972. 1753.

Plants glabrous, erect, 1 meter high or more; blades cordate and clasping, 2–3 cm. wide; bead-like involucres hard and polished, white or gray, 8–10 mm. long.

Cuzco: Santa Ana, *Cook & Gilbert 1424*.—Loreto: Leticia, border of forest, *Williams 3072*. La Victoria, in pasture, *Williams 2630*. Santa Rosa, Yurimaguas, *Williams 4810*. Fortaleza, Yurimaguas, *Williams 4338*. Puerto Arturo, *Williams 5158*. Lower Río Nanay, *Williams 669*. Balsapuerto, in thickets, 150–350 meters, *Killip & Smith 28672*. A native of the Old World, but naturalized widely in the American tropics. "Ullpa mullo," "uchpa mullo," "mullo de la Virgen."

The hard bony involucres resemble beads, and they are used commonly in tropical regions for making necklaces, bracelets, and other ornamental articles. In the East Indies the fruits are used for food.

102. ZEA L. Maize

A coarse annual with broad 2-ranked blades; inflorescences monoecious, the staminate flowers in spike-like racemes, these

numerous and forming large panicles (tassels) terminating the stems; pistillate inflorescence in the leaf axils, the spikelets in 8–30 rows on a thickened woody axis (cob), the whole enclosed in numerous large foliaceous bracts (husks); styles (silk) protruding from the top as a mass of threads; staminate spikelets 2-flowered, in pairs on one side of a continuous rachis.

Zea Mays L. Sp. Pl. 971. 1753. Maize, Indian corn, Maíz.

Cultivated generally in Peru, and the principal grain and food plant of the country, as it is in most other parts of America. Corn is believed to be a native of the highlands of Mexico or Central America, but it is not known in the wild state, nor is it able to maintain itself in competition with wild plants.

Regarding the varieties of maize cultivated in the Department of Cuzco, Professor Fortunato L. Herrera has given a detailed account. His classification of them is reproduced here in part.

I. Flint corn

Uhina, Ubina, Ckello-sara. Common yellow maize. The variety most cultivated, and the one showing the greatest variation from one locality to another. It endures drought and yields well. The ears can remain a long time on the stalks after maturity without loss or deterioration. Used for food in the form of *mote* (boiled), and especially for making *chicha*, the maize of the Province of Paucartambo being particularly valued for the latter purpose.

Piricincu. An early-maturing variety, ripening in three months, so that it is possible to obtain four crops a year. The very small kernels are deep yellow. Employed in the form of *lahua* (meal), and for making *chicha*. Cultivated in the Province of Convención.

Uchucullo. Little cultivated. Kernels deep yellow. Like the preceding variety, it matures in three months.

Ckallhua. Kernels whitish, becoming slightly yellow with age, horny in appearance, lustrous, and transparent. Used for preparing *locro*, *mazamorra*, *mote*, and *chochoca*. Cultivated in the provinces of Paucartambo and Quispicanchi.

Chile-sara. Pearl maize. A form probably imported, perhaps from Argentina. Planted on a small scale. Kernels rather small, horny, somewhat lustrous, pearly, whitish, becoming somewhat yellowish in age, with a small, paler or whitish zone. Meal made from it is white and of pleasant odor and agreeable flavor.

Chaminco, Puca-sara. Common red maize. Like the yellow variety, this shows many variations in different localities. It is characterized by the brilliant orange-red color of the ears and kernels. The latter are hard, horny, and transparent except for a spot over the embryo. It is valued for making *chicha, mote,* and other articles, and is cultivated in the provinces of Paucartambo and Quispicanchi.

Maíz de Nueva Granada. Purple maize, from its name probably imported from Colombia. The ears are large, cylindric-conic, and 20–22 cm. long. The kernels are compressed and irregularly rounded. Cultivated in Quispicanchi and Convención.

Culli. Dark purple maize. Cultivated upon a small scale. Preferred for making the sweet *chicha morada,* a refreshing drink.

Chingo. A slow-growing maize, with wine-colored kernels; ears small; little planted. Province of Anto.

II. Soft or starchy maize

Paraccai-sara. A white maize of vigorous growth, whose ears show great variation in shape and size, and the kernels corresponding differences in shape, size, and color, but they always have certain common characteristics, such as their great development and their mealy consistency, which make them suitable for the preparation of *tamales* and *humintas* of superior flavor. Used also in the form of *mote.* The white meal is highly esteemed. Cultivated in the whole department, especially in the Quebrada de Urquillos, whose product has a high reputation.

Sacsa. Pink or yellowish maize. The kernels vary greatly in size and form, being sometimes compressed, again concave or swollen, and in color yellowish, pink, purple, bluish, etc. They are mealy in consistency, and white in section except for the epidermis in the colored varieties. This variety gives an abundant white meal. It is little cultivated. Eaten chiefly parched.

III. Dent maize

Laurel. Yellow dent corn. Ears small and thick, with large kernels. Used for making *humintas.* Grown in the Province of Convención.

Ico-laurel. Differing from the preceding in its pointed kernels. Employed for the same purpose, also for *mote.* Cultivated in Convención.

Chchunchu-sara, Maíz chuncho. Ears very long and slender, the small kernels variously colored. Used as feed for poultry. Cultivated in Convención.

Huaira-sara, Maíz morado. Kernels coffee-colored or gray. Used for making wine-colored *chicha;* also eaten parched. Cultivated in the provinces of Paucartambo and Quispicanchi.

IV. Sweet corn

Chchullpi. The common wrinkled yellow sweet corn, with many varieties. The preferred forms are those related to the white varieties of maize. Cultivated on a small scale. Common to Peru and Argentina, where probably it was introduced by the Incas. Sometimes eaten parched or as *mazamorra.* Cultivated in Urubamba and Quispicanchi.

Pesccoc-runtum, Chchuspi. Kernels gray, with whitish granulations. Eaten parched, and made into *chicha.* Cultivated in Urubamba, Quispicanchi, and Paucartambo.

Other varieties

The following forms it is difficult to classify definitely with those listed above:

Chihuanuai. Kernels pale red. Used for making *chicha.*

Capulí. Kernels bright red. Used for *chicha.* Grown in the Province of Urubamba.

Occe-sara. Kernels lead-colored or coffee-colored. Eaten parched. Grown in Urubamba, Quispicanchi, and Paucartambo. *Sara* is the Quechua name for maize.

Pata-pfahuaucue and *Hualla.* Cultivated in the valleys.

Tristachya microstachya Nees ex Steud. Syn. Pl. Glum. 1: 238. 1854.

This was described originally from "Lima," but, according to Hitchcock (Contr. U. S. Nat. Herb. 24: 423. 1927), the plant described is not known from Peru, and seems to be rather a species of *Trichopteryx.* Probably it is an African plant, attributed in error to Peru.

15. CYPERACEAE. Sedge Family

References: C. B. Clarke in Urban, Symb. Ant. 2: 8-169. 1900; also Kew Bull. Misc. Inf. Add. Ser. 8: 93–154. 1908. Kunth, Enum. Pl. 2. 1837. Steudel, Syn. Cyp. 1855. Britton & Wilson, Surv. Porto Rico 5: 78–111. 1923.

The following keys to the sedges of Peru are not always precise enough to lead to many varieties or forms that most of the species from time to time exhibit. Accurate determination, however, is practically impossible without comparative herbarium material. The antarctic genus *Schoenus*, recorded by Weberbauer, 223, from Junín, was a misidentification of *Scirpus rigidus* Boeckl.

Flowers perfect (or partly).

Spikelets floriferous throughout, or only 1 or 2 spikelets empty.

Scales more or less obviously distichous.

One perfect flower in each spikelet.....1. *Kyllinga.*

Two to many perfect flowers in each spikelet.

Filaments greatly elongating, showy.....2. *Comostemum.*

Filaments not elongating.....3. *Cyperus.*

Scales spirally imbricate.

Achene tipped with a tubercle (style base).

Stems leafless; spikelet 1.....4. *Eleocharis.*

Plants leafy; spikelets several to many.....5. *Bulbostylis.*

Achene naked at tip.

Flowers without inner scales; inflorescence often glabrous.

Style base enlarged; bristles none .....6. *Fimbristylis.*

Style base not enlarged; bristles usually present. 7. *Scirpus.*

Flowers with 2–3 hyaline or petal-like scales; plants often somewhat hairy.

Plants partly hairy; scales 3, broad, alternating with bristles.....8. *Fuirena.*

Plants slightly scabrous; scales 2, hyaline; bristles none. 10. *Lipocarpha.*

Spikelets with usually 3 or more of the lower scales empty.

Flowers all hermaphrodite, the spikelets 3–many-flowered.

Spikes about 5 mm. long.....9. *Hypolytrum.*

Spikes 10–15 mm. long.....11. *Diplasia.*

Flowers 1–2, rarely more, often some of them male or sterile. 12. *Dichromena.*

Flowers unisexual.

Pistillate flowers merely subtended by scales.

Spikelets with pistillate flower at base, or not terminal. 13. *Scleria.*

Spikelets with the terminal flower pistillate.....14. *Becquerelia.*

Pistillate flowers enclosed in a perygynium.

Rachilla (a bristle) exserted, hooked or retrosely barbed at tip. 15. *Uncinia.*

Rachilla included or none.....16. *Carex.*

1. KYLLINGA Rottb.

Reference: Pfeiffer, Repert. Sp. Nov. 27: 92–100. 1929.

Grass-like (one species leafless) annuals or perennials with triangular stems terminating in a simple or slightly compound, very dense head of spikelets, strictly sessile in an involucre of 2 or more leaves.

Culms cespitose; heads usually more than one; annuals.

Fertile scale reddish-glandular..... *K. odorata.*

Fertile scale scabrous-ciliate, not glandular..... *K. pumila.*

Culms not cespitose from perennial rootstocks.

Leaves reduced to sheaths..... *K. peruviana.*

Leaf blades developed.

Leaves much shorter than the culms..... *K. pungens.*

Leaves and culms about equal in length..... *K. brevifolia.*

Kyllinga brevifolia Rottb. Descr. & Icon. 13. 1773.

Similar to *K. pungens*, but the longer leaves gradually acuminate. —Illustrated, Clarke, Ill. Cyp. *pl. 1.*

Lima: Lima, *65.*—Loreto: Paca (*Huber 1578*). Iquitos, 100 meters, *Williams 7931; Killip & Smith 27078.* Lower Río Nanay, *Williams 323.*—San Martín: Tarapoto, *Williams 6181, 6187.* Widely distributed in tropical America. "Caballusa."

Kyllinga odorata Vahl, Enum. 2: 382. 1806.

Scarcely distinguishable from *K. pumila* except that the fertile scale is depressed-glandular and has a smooth keel. The spikelets may be more yellowish.—Illustrated, Clarke, Ill. Cyp. *pl. 2.*

Cajamarca: *Raimondi* (det. Gross).—San Martín: Tarapoto, *Williams 6164* (det. Gross). Widely distributed in tropical America.

Kyllinga peruviana Lam. Dict. 3: 366. 1789. *K. vaginata* Lam. Ill. Gen. 1: 148. 1792. *Cyperus peruvianus* F. N. Williams, Bull, Herb. Boiss. II. 7: 90. 1907.

The basal leaves of this species are reduced to sheaths; nutlet half as long as the scales.—Illustrated, Engl. & Drude, Veg. Erde 9, pt. 2: 199.

Peru: *Dombey* (Lam. loc. cit.). Tropical America and Africa.

Kyllinga pumila Michx. Fl. Bor. Amer. 1: 28. 1803.

Plants densely tufted, usually 10–30 cm. high; flower heads oblong or ovoid, 6-8 mm. long, green.—Illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 296.

Ayacucho: Estrella, 500 meters, *Killip & Smith 22678*.—Junín: Chanchamayo Valley, 1,000 meters, *Schunke 256, 242, 249*. Puerto Yessup, 400 meters, *Killip & Smith 26323*. Between Puerto Bermúdez and Cahuapanas, *Killip & Smith 26698*.—Loreto: Yurimaguas, *Williams 4474*.—San Martín: Moyobamba (Weberbauer, 291). San Roque, *Williams 7451*. Tropical America; Africa.

Kyllinga pungens Link, Hort. Berol. 1: 326. 1827. *K. obtusa* Presl, Rel. Haenk. 1: 183. 1828, acc. to Clarke.

This perennial was found growing in masses in a bottomland pasture near Chosica. Its leaves are merely acute; nutlet scarcely half as long as the scales.

Lima: Chosica, *2877*.—Huánuco: (*Haenke*). Tropical America; Africa and Asia.

COMOSTEMUM Nees

Androtrichum Brongn. ex Kunth, Enum. Pl. 2: 250. 1837.

Leafless rush-like perennials, the round culms terminating in an umbel of more or less closely clustered, globose heads that, especially in fruit, become shaggy with the greatly elongate, crinkly filaments.

Comostemum montevidense (Link) Nees, loc. cit. *Eriophorum montevidense* Link, Hort. Berol. 1: 331. 1821. *Abilgaardia polycephala* Brongn. in Duperrey, Voy. Bot. 2: 175. 1829. *Cyperus globuliferus* Presl, Rel. Haenk. 1: 165. 1828.

This plant, striking though it is, is apparently rare in Peru, or not observed.—Illustrated, Fenzl, Denkschr. Akad. Wiss. Wien 8: *pl. 3*.

Huánuco: (*Haenke*). Brazil and Uruguay.

3. CYPERUS L.

Grass-like herbs with usually triangular stems, leafy at base and with one or more leaves like an involucre below the inflorescence. Spikelets mostly flat, often in clusters or heads arranged in a terminal

umbel. Flower without bristles. Achene lenticular or triangular, apically naked.—A number of species besides those recorded below, that are generally distributed, are, of course, to be expected. *C. striatus* R. & P. is omitted from the key, since it can not be identified from description.

Style branches 2; achenes not angled.

Spikelets 1.5–2.5 mm. wide.

Spikelets apparently lateral.....*C. laevigatus.*

Spikelets obviously terminal.

Spikelets in a head-like cluster.

Scales brown or greenish.....*C. melanostachys.*

Scales black-red or purple.....*C. niger.*

Spikelets more or less distinctly umbellate.

Scales dull, grayish yellow-brown; achene green.*C. odoratus.*

Scales lustrous, green, or brown or brown-edged; achene dull.....*C. rivularis.*

Spikelets about 5 mm. wide, spicate.....*C. unioloides.*

Style branches 3; achenes angled.

Spikelet rachis deciduous (at least in part) with the mature scales or fruit.

Spikelet rachis breaking into 1-fruited joints; coarse soft-leaved annual.....*C. ferax.*

Spikelet rachis deciduous above the two lower scales, not separating.

Spikelets 1–2-flowered (or rarely more), but densely congested.....*C. cayennensis.*

Spikelets 2–5-flowered, distant or the spikes digitate or umbellate.

Spikelets often shorter than 6 mm. and spikes narrower than 1 cm.

Spikes oblong, 8 to rarely 10 mm. thick.....*C. ligularis.*

Spikes long-cylindrical, rarely 7 mm. thick.*C. incompletus.*

Spikelets 5–9 mm. long and the spikes broader than 1 cm.

Spikes digitate.....*C. hermaphroditus.*

Spikes subumbellate or umbellate.

Spikelets remote; leaves 6–7 mm. wide..*C. Meyenianus.*

Spikelets crowded; leaves 3–5 mm. wide.*C. caracasanus.*

Spikes solitary.....*C. panamensis.*

Spikelet rachis persistent.
Spikelet rachis broadly or definitely winged.
Annual plant, flowering the first year; leaves shorter than culms, usually narrower than 6 mm., or none.*C. radiatus.*
Perennials; leafless or the leaves usually broader than 6 mm.
Leafy plants.
Scales 3–5-nerved.
Spikelets 1–2.5 cm. long.....*C. esculentus.*
Spikelets 6–10 mm. long.....*C. rigens.*
Scales 7-nerved.....*C. prolixus.*
Leafless, the culms apparently septate.
Culms subterete and 3–4 mm. thick above..*C. articulatus.*
Culms angled and about half as thick above...*C. nodosus.*
Spikelet rachis obscurely (or rarely narrowly) or not at all winged, often compressed.
A. Perennials (not always clearly so).
B. Spikelets digitate or crowded into heads.
Leaves 2–3 mm. broad; usually shorter than the culms; spikelets ovate.
Spikelets 8–11 mm. long or very loose.
Spikelets in loose heads.....*C. surinamensis.*
Spikelets in corymbose umbels.....*C. Schraderi.*
Spikelets 3–6 mm. long, congested.
Inflorescence umbellate.....*C. tabina.*
Inflorescence capitate.....*C. seslerioides.*
Leaves usually 4–16 mm. broad (or lacking), about equaling (or exceeding) the culms; spikelets (except in *C. Luzulae*) linear-oblong.
Leaves many, 8–16 mm. wide; inflorescence lax.
C. chalaranthus.
Leaves few to many, 4–7 (–10) mm. wide; inflorescence congested or, if open, rigid.
Stamens 2–3; plants somewhat viscid or scales 9–11-nerved.
Culms or leaves viscid.....*C. elegans.*
Culms and leaves glabrous.....*C. Buckleyi.*
Stamen 1; scales 3–5-nerved or nerveless.

Spikelets 3–6 mm. long, reddish brown or greenish, the spikes irregularly congested.

Umbel single.....*C. Luzulae.*

Umbel compound.....*C. tabina.*

Spikelets much longer, pale or brown.

Rays of the umbel exceeding the culm. *C. simplex.*

Umbel more or less contracted.

Umbel capitate; basal leaves longer than the culm, to 10 mm. broad...*C. miliifolius.*

Umbel rather open; basal leaves equaling or shorter than culm or the leaves 2 cm. broad.

Spikelets 3 mm. wide, yellowish. *C. Eragrostis.*

Spikelets 2.5 mm. wide, purplish. *C. saturatus.*

B. Spikelets spicate (*C. articulatus* might be sought here).

Leaves smooth, or nearly so, to 1 cm. wide....*C. distans.*

Leaves scabrous, setaceous.....*C. Schraderi.*

A. Annuals (cf. *C. saturatus*).

Culms 1-headed; spikelets green.

Leaves smooth; bracts 2.....*C. humilis.*

Leaves scabrous, bracts 3–4.....*C. seslerioides.*

Spikes umbellate; spikelets brown or yellowish.

Spikelets digitate; scales 3–5-nerved, often with orange margins.....*C. amabilis.*

Spikelets spicate; scales green, the edges yellow or purple.

Scales obtusish; rootstocks obvious....*C. sphacelatus.*

Scales sharply acute or acuminate; roots fibrous. *C. compressus.*

Cyperus amabilis Vahl, Enum. 2: 318. 1806.

An annual, the culms about twice as long (0.5–1 dm.) as the narrow (2 mm.) leaves; umbel compound or simple, the bracts to 5 cm. long; spikelets fasciculate, orange-brown, 2 mm. wide; scales ovate, truncate, often mucronate, the nerveless margins orange, the back with 3–5 green nerves; stamen 1; achene obovoid, 3-angled, equaled by the 3-branched style.—*C. uncinatus* Poir. is

similar, but the scales are rusty-brown and strongly 3–5-nerved, the keel conspicuously mucronate or awned.

Cuzco: Valle de Lares (*Herrera 669*). In warm regions around the world.

Cyperus articulatus L. Sp. Pl. 44. 1753.

Rootstocks thick, scaly, reddish; culms stout, sometimes 2 meters tall, here and there with a node-like articulation; basal leaves reduced to scarious sheaths; involucral leaves about 3, ovate or narrower, shorter than the several-rayed compound umbel; spikelets narrowly linear, 1.5–5 cm. long; scales ovate, straw-color, 3 mm. long; achene black.—The Peruvian plant is forma *longispiculosus* Kükenth., with lax many-flowered spikelets 5 cm. long, or the subsp. *corymbosus* Rottb., with the inflorescence crowded. It is a medicinal herb, called "piri-piri" (Klug).

Libertad: *Raimondi 1938*.—Loreto: Mishuyacu, *Klug 619* (det. Gross). Tropics of both hemispheres.

Cyperus Buckleyi Britton, Contr. U. S. Nat. Herb. 2: 461. 1894.

Stout, several dm. high; umbel rays 5–7, to 1 dm. long; spikelets broadly linear, 12–20 mm. long, clustered in loose heads of 12–30 at the ends of the rays, the rachis not winged; scales oblong-ovate, obtuse or truncate, with a dark keel and lighter brown, somewhat scarious margins, 9–11-nerved; stamens 3; achene triangular, obtuse with a sharp point.—The very different *C. Haspan* L. (to be expected) would key here. Its broad leaves are reduced to thin pointed sheaths.

Huánuco: Mito, 2,700 meters, *1777* (det. Gross). Ranging northward to the United States.

Cyperus caracasanus Kunth, Enum. Pl. 2: 86. 1837.

Scabrous basal leaves equaling the glabrous angled culms; involucral leaves elongate, often many; umbel simple, 6–12-rayed; spikelets densely congested, linear-lanceolate, to 6 mm. long, slightly compressed, 5–6-flowered; scales elliptic-oblong, rounded at apex, the upper mucronulate, 13-nerved, brown-lineate, the keel green, the margins hyaline, the lowest subulate; achene oblong, triangular, punctate-scabrous, pale chestnut, a third shorter than the scale.

Junín: Chanchamayo Valley, *Schunke 134* (det. Gross). General in tropical America.

Cyperus cayennensis (Lam.) Britton, Bull. Dept. Agr. Jamaica 5: Suppl. 1: 8. 1907. *Kyllinga cayennensis* Lam. Ill. 1: 149. 1791. *Mariscus huarmensis* HBK. Nov. Gen. & Sp. 1: 214. 1816, acc. to Clarke. *C. flavus* Nees, Linnaea 19: 698. 1847.

Glabrous, from short rootstocks; stems and leaves 1–6 dm. long, the leaves 7 mm. wide or less; umbels simple; bracts 1–3 dm. long; spike ovoid-cylindric, 1–2 cm. long and half as wide, yellowish; spikelets ellipsoid, the empty bracts deciduous, the 1–2 fertile ones ovate; style 3-parted; nutlets oblong-obovoid, 3-angled, 1–2 mm. long.—The Peruvian plant is often var. *pedunculatis* Britton, with peduncled spikes, or var. *redolens* (Maury) R. Gross, with more numerous (6–10) flowered spikelets. The related *C. globulosus* Aubl. has globose heads and achenes twice as long as thick.

Ancash: Santa, Huarmei (HBK. loc. cit.).—Cajamarca: Cutervo, *Raimondi*.—Junín: Tarma, *Killip & Smith*.—Lima: Matucana, 2,400 meters, *304*.—Loreto: Pebas, *Williams 1641*. Yurimaguas, *Williams 4342, 4413, 3949*.—San Martín: Tarapoto, *Williams 7252, 5501, 6041* (det. Gross). Patagonia to Mexico and West Indies.

Cyperus chalaranthus Presl, Rel. Haenk. 1: 177. *pl. 32*. 1828. *C. diffusus* Auth., vix Vahl, Enum. 2: 321. 1806, a much coarser plant of India and the Philippines.

Stems several dm. high, sharply angled, leafy; leaves half as long or longer; involucral leaves about 8, often twice as long as the rays of the compound umbel; central rays very short; spikelets greenish, oblong, to 2.5 cm. long, loosely flowered; scales ovate, 5-nerved, mucronate; achene elliptic-ovate, smooth, black.

Ayacucho: Aina, *Killip & Smith 22797*.—Huánuco: Pozuzo, 600 meters, *4612*.—Junín: Chanchamayo Valley, *Schunke 251, 243, 252, 1486, 403, 45, 402*. Puerto Yessup, 400 meters, *Killip & Smith 26346*. La Merced, 700 meters, *Killip & Smith 23685*.—Loreto: Lower Río Nanay, *Williams 322* (det. Gross). Yurimaguas, *Williams 3830, 3951, 4414, 4415*. Caballo-cocha, *Williams 2054*. La Victoria, *Williams 2576*. Timbuchi, *Williams 877*. Mishuyacu, *Klug 255*. Iquitos, *Killip & Smith 27248*.—San Martín: Tarapoto, *Williams 6039, 5493*. San Roque, *Williams 7253, 7697*. Generally distributed in tropical America. "Puripiri."

Cyperus compressus L. Sp. Pl. 46. 1753.

A wiry-stemmed plant with fibrous roots, related to *C. sphacelatus*, but the pale clustered spikelets lanceolate, 3–5 mm. broad;

scales light green, yellowish-margined.—*C. rotundus* L., with rootstocks and purple or chestnut scales, is to be expected.—Both illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 300, 304.

Loreto: Iquitos, 100 meters, *Killip & Smith 27436*.—Tumbes: *Raimondi* (det. Gross). Warm regions of both hemispheres.

Cyperus distans L. f. Suppl. 103. 1781.

A rather stout perennial several dm. to 1.5 meters tall, the leaves (about 1 cm. wide) sometimes even higher; umbel usually compound, to 2 dm. broad; spikelets 1 cm. wide, 2–3 cm. long; scales oblong, obtuse, remote, reddish brown; stamens 3; nutlet brownish black, 3-angled, oblong-ellipsoid, 1.5 mm. long, the style much shorter.—Illustrated, F. M. Bailey, Weeds Queensland 212.

Cajamarca: Cascas, *Raimondi* (det. Gross). Old and New World tropics.

Cyperus elegans L. Sp. Pl. 45. 1753.

A well-marked low (2–7 dm.) species with somewhat viscid-pubescent culms and an umbellate inflorescence with the clustered spikelets digitate.—*C. oxylepis* Nees is similar, but the spikelets are a third broader (4–5 mm.).—Illustrated, Field Mus. Bot. 3: 69 (fruit).

Piura: Negritos, *Haught F6*.—Peru: *Raimondi*. North to Mexico.

Cyperus Eragrostis Lam. Ill. 1: 146. 1791. *C. vegetus* Willd. Sp. Pl. 1: 283. 1797.

Similar to *C. miliifolius*, but often taller and the leaves broader; umbel rays 1–10 cm. long; spikelets 1 to nearly 2 cm. long, 3 mm. wide; scales yellowish, the keel sometimes serrulate.—The correct name may be *C. vegetus*.—Illustrated, Koorders, Exkursionsfl. Java 1: 184.

Huánuco: Mito, *1419*. Western South America to California.

Cyperus esculentus L. Sp. Pl. 45. 1753.

Often stout and several dm. high, from tuberous rootstocks; leaves to 8 mm. broad, the several involucral leaves in part exceeding the ample umbels; spikelets spike-like, straw-colored or golden, flat and spreading, often 2 cm. long or longer; scales 3–5-nerved.—The similar *C. rotundus* L. has brownish or greenish purple spikelets to 4.5 cm. long. This widely distributed weedy *Cyperus* will probably be found about haciendas in many localities.

Ica: *Raimondi.*—Lima: *Raimondi.*—Cuzco: Valle de Santa Ana, *Herrera 890.* Widely distributed in tropical and temperate America.

Cyperus ferax L. C. Rich. Act. Soc. Hist. Nat. Paris 1: 106. 1792. *C. lomentaceus* Nees & Meyen, Linnaea 9: 285. 1834 (?). *C. cephalophorus* Presl, Rel. Haenk. 1: 170. 1828 (?).

The only Peruvian species with the spikelet rachis disarticulating; spikelets yellowish or brown, linear, subterete, 1–2 cm. long, spicate; umbel rays often many cm. long or greatly reduced.—Illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 306. My collections were made along irrigating ditches. A form with congested inflorescence is var. *conglobatus* (Link) Kükenth. or var. *densiflorus* L. C. Rich., according to Gross.

Ayacucho: Prov. Huanta, *Raimondi* (the var., det. Gross).—Junín: Río Pichis, 350 meters, *Killip & Smith 26701.*—Lima: Lima, *66.* Chosica, 900 meters, *529.*—Loreto: Iquitos, *Williams 1420.* La Victoria, *Williams 2609.* Pebas, *Williams 1957.* Puerto Arturo, *Williams 5060.* Generally distributed in tropical America.

Cyperus hermaphroditus (Jacq.) Standl. Contr. U. S. Nat. Herb. 18: 88. 1916. *Carex hermaphrodita* Jacq. Coll. Bot. 4: 174. 1790. *Mariscus Jacquinii* HBK. Nov. Gen. & Sp. 1: 216. 1816. *C. Ruizianus* Boeckl. Linnaea 36: 360. 1869 (?).

Rather stout, several dm. high, the leaves sometimes 8 mm. broad, shorter; umbels ample; bracts often many, 1.5–2.5 dm. long; spikes to 4 cm. long, greenish yellow; fertile scales ovate, obtuse, the empty ones lanceolate and mucronate or caudate; style much shorter than the narrowly ellipsoid nutlet.

Junín: Chanchamayo Valley (Weberbauer, 247).—Lima: Atocongo, *Pennell 14768.*—Huánuco: Mito, *1513* (det. Gross). Southeast of Huánuco, *2137.* Widely distributed in tropical America.

Cyperus humilis Kunth, Enum. Pl. 2: 23. 1837.

A glabrous cespitose annual, usually lower than 1 dm., the leaves 2–3 mm. wide, often exceeding the culms that terminate in a 3-bracted capitate inflorescence; bracts 3–5 cm. long; spikelets to 1 cm. long, green or pale, compressed; scales ovate, acute, 3-nerved; nutlet narrowly obovoid, trigonous, black; style short, the 3 branches linear.—The Peruvian plant is var. *elatior* Britton, taller, more robust, the ovoid achene yellowish brown.

Tumbes: *Raimondi* (det. Gross). Ranging to Mexico and Cuba.

Cyperus incompletus (Jacq.) Link, Hort. Berol. 1: 319. 1827. *Kyllinga incompleta* Jacq. Coll. Bot. 4: 101. 1790. *Cyperus Mutisii* Griseb. Fl. Brit. W. Ind. 567. 1864.

Similar to *S. hermaphroditus;* leaves often twice as broad; spikes narrowly cylindric, digitate; spikelets rather distant.—A perennial with rootstocks.

Cuzco: Valle de Santa Ana, Prov. Convención (*Herrera 198*).—Cajamarca: Cutervo, *Raimondi* (det. Gross). Colombia; Venzuela; West Indies; Mexico.

Cyperus laevigatus L. Mant. 2: 179. 1771. *C. viridulus* Boeckl. Linnaea 35: 485. 1868 (?). *C. reptans* Boeckl. loc cit. (?).

Rather stout, 1 to several dm. high, from a horizontal rootstock; leaves long-sheathing, sometimes bladeless, the involucral leaves one and erect or two; spikelets 6–12 mm. long, 2–3 mm. wide, compressed; scales ovate, obtuse, brown or pale; achene obovoid, brown. —Illustrated, Journ. Linn. Soc. 21: *pl. 3, 4.*

Arequipa: Saline plains (*Günther & Buchtien 363;* det. Pfeiffer).—Cajamarca: Nanchó, *Raimondi* (det. Gross).—Ica: *Raimondi.*—Libertad: Trujillo, *Killip & Smith 21513.*—Piura: Negritos, *Haught F7.* Tropics of the New and Old World, to the southern United States.

Cyperus ligularis L. Amoen. Acad. 5: 391. 1759. *Mariscus rufus* HBK. Nov. Gen. & Sp. 1: 216. 1816.

Resembling *C. incompletus,* but the rootstocks short or undeveloped; culms sometimes a meter high or taller, and leaves to 2 cm. broad, rough-margined; spikes oblong-subglobose.—Illustrated, Bull. Herb. Boiss. II. 1: *pl. 6;* Field Mus. Bot. 3: 72 (fruit).

Cuzco: Valle de Santa Ana, *Herrera 888.*—Piura: Pariñas Valley, *Haught F39.*—Loreto: Yurimaguas, *Williams 4641.* Tropical America and Africa.

Cyperus Luzulae (L.) Retz. Obs. 4: 11. 1786. *Scirpus Luzulae* L. Sp. Pl. ed. 2. 75. 1762.

Plants 2 to many dm. high, from a short rootstock, the leaves 3–7 mm. wide, often exceeding the culms; umbel usually simple, the rays short; spikelets congested in dense irregular heads, ovate, flat; scales oblong, reddish brown, twice as long as the oblong obovoid nutlet.—Said by Huber, Bol. Mus. Goeldi 4: 528. 1906, to be a common pasture plant of the Andes.—Illustrated, Rottb. Descr. & Icon. *pl. 13.*

Junín: Chanchamayo Valley, *Schunke 245, A72* (det. Gross).—Loreto: La Victoria, *Williams 2590.* Caballo-cocha, *Williams 2280.* Paraíso, *Williams 3218.* Iquitos, *Williams 1450.* Yurimaguas, *Williams 4704, 4411.*—Puno: *Raimondi* (det. Gross).—San Martín: San Roque, *Williams 7038.* General in tropical America.

Cyperus melanostachyus HBK. Nov. Gen. & Sp. 1: 207. 1816. *C. cimicinus* Presl, Rel. Haenk. 1: 166. 1828 (?). *Pycreus cimicinus* Pfeiff. Repert. Sp. Nov. 28: 17. 1930.

Culms slender, tufted, angled, 1–6 dm. high, about equaled by the linear leaves; involucral leaves usually 3; spikelets densely capitate-clustered, now and then with one elongate ray, lanceolate, 5–12 mm. long and 2.5 mm. broad; scales ovate, brown or greenish.—The plant described by Presl is said to have somewhat turgid spikelets and (always?) a tuberculate-rugose achene. It may be separable. The HBK. plant is possibly only a form of *C. niger* R. & P. Neg. 11230.

Huánuco: Mito, *1449.* Southeast of Huánuco, *2141.*—Cajamarca: Cutervo and Nanchó, *Raimondi* (var., det. Gross).—Lima: *Dombey 41.* Colombia to Mexico.

Cyperus Meyenianus Kunth, Enum. Pl. 2: 88. 1837. *C. subulatus* Nees & Meyen, non R. Br. 1810.

Culms and leaves 2–4 dm. long, the latter 6–7 mm. wide; rhizome short; umbel rays usually 3–7 cm. long; bracts long, 6–9; spikes solitary or 2–3-umbellate, 2–2.5 cm. long and 1–1.5 cm. broad, cylindric; fertile scales 3–4, oblong-elliptic, obtuse, a third exceeding the linear-oblong achene. Neg. 11231.

Arequipa: Mejía (*Günther & Buchtien 362,* det. Pfeiffer).—Cuzco: Valle de Santa Ana, *Herrera 887.* Bolivia to Brazil and Mexico.

Cyperus miliifolius Poepp. & Kunth in Kunth, Enum. Pl. 2: 29. 1837.

Rhizomatous, the culms 1–4 dm. high; leaves longer, 4–7 mm. broad; umbel contracted or capitate; bracts several; spikelets to 2.5 cm. long, 2.5 mm. wide, 16–many-flowered, compressed, pale or brown; scales ovate-lanceolate, scabrous-glandular; stamen 1; nutlet obovoid, truncate, pale.—The Iquitos plant is the stiffer-stemmed var. *firmulus* Kükenth. (Gross).

San Martín: Tocache (*Poeppig*).—Loreto: Iquitos, *Ule 6259; Killip & Smith 27133* (the last det. Gross).

Cyperus niger R. & P. Fl. 1: 47. 1798.

A tufted annual with soft culms; leaves basal, 1.5–2 mm. wide, about 5 cm. long; involucral bracts 2–3, unequal; spikes ovate, rather loosely clustered, 5–7 mm. long; scales very dark, with green midrib and sometimes edges, scarcely 2 mm. long; achene young but faintly reticulate, strongly compressed.—With the help of Professor Negri, Director, Botanical Institute, University of Florence, I found in their Ruiz and Pavón collection three specimens of *C. niger*, one so labeled by Pavón. Two of these are tall plants with lateral inflorescence, that Professor Emilio Chiovenda had referred to *C. laevigata* var. *distachya* All. The third he had referred to *C. niger*, a disposition I think correct. My description is from this plant.

Lima: Provinces of Cercado and Chancai, Ruiz & Pavón.—Huánuco: Mito, *1449*. Southeast of Huánuco, *2140*.

Cyperus nodosus Willd. Enum. Hort. Berol. 72. 1809.

Similar to *C. articulatus* and could be considered a variety, with culms triangular above and more slender; bracts 5–10 mm. long. Neg. 11241.

Peru: (Willd. loc. cit.).—Lima: Chosica, *528. Raimondi*.—Loreto: Yurimaguas, *Williams 4152*.—Libertad: *Raimondi*.—Cajamarca: Nanchó, *Raimondi*. Lombaicegne, *Raimondi* (det. Kükenthal). Western South America to Central America and Jamaica.

Cyperus odoratus L. Sp. Pl. 46. 1753.

An annual or perennial with slender tufted culms a few cm. to several dm. high; leaves as long or shorter, 2–5 mm. wide; umbel 1–few-rayed, the rays to 5 cm. long; spikelets linear; scales dull, gray- or yellow-brown, twice as long as the grayish oblong achene.—Illustrated, Burman, Fl. Ind. *pl. 8*.

Peru: Not reported, but certainly occurring, since generally distributed.

Cyperus panamensis (Clarke) Britton in Standley & Calderón, Lista Pl. Salvador 40. 1925, and Journ. Wash. Acad. Sci. 15: 457. 1925. *Mariscus panamensis* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 15. 1908.

Glabrous, scarcely rhizomatous, the culms 2.5 dm. long, the leaves (to 5 mm. broad) two-thirds as long; bracts 4 or 5, 1–2 dm. long, or two or three times exceeding the umbel rays; spikes simple, solitary, dense, yellowish brown, the linear-oblong spikelets 1 cm.

long, with 3–5 achenes, their scales ovate, obtuse, 7–9-nerved, with a long-mucronate green keel; style 3-parted.—Allied to *C. Meyenianus.*

Tumbes: *Raimondi* (det. Gross). Ecuador; Central America.

Cyperus prolixus HBK. Nov. Gen. & Sp. 1: 206. 1816.

Culms triangular, glabrous; leaves scabrous on keel and margins; umbels compound, many-rayed, the rays fasciculately branched terminally; spikelets spicate-congested, 7–13-flowered, the rachis winged; scales remote, oblong, acute, below the tip mucronulate, 7-nerved, brownish with a green keel and yellowish margins; achene brown, puncticulate, linear-oblong, triangular; style trifid, long.—Illustrated, Fenzl, Denkschr. Akad. Wiss. Wien 8: *pl. 2.*

Lima: Río Rimac, *Raimondi.* Brazil to Colombia and Central America.

Cyperus radiatus Vahl, Enum. 2: 369. 1806.

Culms several dm. high, usually angled, often taller than the narrow (to 6 mm. wide) leaves; umbels compound, the outer rays 2.5–10 cm. long, the inner very short; spikes congested, the spikelets numerous, compressed, 8–30-flowered; scales ovate-elliptic, mucronate, the tip spreading, usually brownish yellow, twice as long as the triangular achene.—The huge *C. giganteus* Vahl would be sought here. It has no basal leaves and its rachis wings are deciduous, as in the also similar *C. digitatus* Roxb. which, however, is leafy. Both these species may be found. Said by Huber, Bol. Mus. Goeldi 4: 527. 1906, to be common on the Río Ucayali.—Illustrated, Lecomte, Fl. Indo-Chine 7: 73. (fl.).

Loreto: *Raimondi* (det. Gross); (*Huber 1317*). Tropical America: Asia; Africa. "Barba de bode."

Cyperus rigens Presl, Rel. Haenk. 1. 170. 1828. (?)*C. tacnensis* Nees & Meyen ex Meyen, Reise 1: 431. 1834; cf. Steud. Syn. Cyp. 42. 1855.

Culms rigid, 3 to several dm. high, about equaled by the leaves, these 6–12 mm. broad; umbel rays unequal, 2.5–10 cm. long, the bracts longer; spikelets congested in ovate-globose heads, oblong-lanceolate, 6–10 mm. long; scales acutish, remote, shortly mucronate below the tip, greenish yellow with brownish red edges, twice as long as the puncticulate, blackish brown achene.—These specimens agree fairly well with the original description, but the spikelets are 4–6-(instead of 8–10-) flowered, the scales are reddish black toward

the margins or even dorsally, and indistinctly nerved. The plants were very robust, in large clumps 60–90 cm. high. They represent the var. *Weberbaueri* Kükenth. Repert. Sp. Nov. 26: 251. 1929. Var. *latifolius* Kükenth. op. cit. 252, has fleshy flat culms and leaves and bracts to 12 mm. wide, strongly septate-nodose. Var. *rufidulus* (Steud.) Kükenth. (*1563* acc. to Gross) has leaves 4–8 mm. wide and ovate-oblong spikes to 2 cm. long and 1.5 cm. wide.

Tacna: (*Haenke; Meyen*).—Arequipa: Atico, *Raimondi 11608* (det. Kükenthal).—Lima: Matucana, *173*, *Weberbauer 142; Raimondi 12114* (det. Kükenthal).—Ancash: Huaraz, *Raimondi 700* (det. Kükenthal).—Huánuco: Mito, *1563*. "Ragis."

Cyperus rivularis Kunth, Enum. 2: 6. 1837.

Except as indicated, very much like *C. odoratus*.—Our form is var. *lagunetto* (Steud.) Kükenth.—*C. flavescens* L., similar to both species, has very yellow spikelets and lustrous black achenes.—Typical form illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 298.

Huánuco: Mito, *1454* (det. Gross). Colombia to Chile.

Cyperus saturatus Clarke, Bot. Jahrb. 37: 517. 1906. *Mariscus saturatus* Clarke in Donn. Sm. Pl. Guat. 4: 158. 1895, nomen.

Similar to *C. miliifolius*, but apparently an annual; culms 4 dm. high, the leaves twice as long, 2 cm. broad; spikes fasciculate in a subsimple umbel 8 cm. broad; achene a third shorter than the scale.—Differs at once from *C. Eragrostis* in its greatly elongate leaves.

Huánuco: Between Monzón and Huallaga, *Weberbauer 3875, 3685*. Costa Rica.

Cyperus Schraderi Macbr. Field Mus. Bot. 4: 167. 1929. *C. Martianus* Schrad. ex Nees in Mart. Fl. Bras. 2, pt. 1: 32. 1842, non Schult. 1824.

Culms rigid, sulcate, leafy below, several dm. high, taller than the linear setaceous-acuminate scabrous-edged leaves; umbels corymbose, 11–14-rayed; spikelets 8 mm. long, compressed; scales oblong, acute, mucronate, 3-nerved, yellowish brown or green on the back, lustrous; stamen 1; style trifid, the oblong triangular achene acute.—A robust plant.

Ayacucho: Huanta, *Raimondi* (det. Gross).—Puno: Valley of Sandía (*Weberbauer 237*).—Huánuco: Pozuzo, *4611* (det. Gross).—San Martín: Tarapoto to Moyobamba, *Raimondi* (det. Kükenthal). Brazil.

Cyperus seslerioides HBK. Nov. Gen. & Sp. 1: 209. 1816.

Usually about 1 dm. high or shorter, with shorter grass-like scabrous-margined leaves and 3-bracted, capitately congested spikelets; spikelets ovate, 4 mm. long; scales lanceolate, acute, yellowish; achene obovate, 3-angled, punctate-scabrous.—Inflorescence a globose head, often twice exceeded by the bracts. Culms often sprawling.

Lima: Matucana, *449; Weberbauer 171* (var. *alpinus* Kükenth.). —Arequipa: Arequipa, *Pennell 13179.* Venezuela; Bolivia; Argentina.

Cyperus simplex HBK. Nov. Gen. & Sp. 1: 207. 1816.

Like *C. miliifolius* but often small (2–15 cm.), and the umbel rays elongate (1–2 dm.), exceeding the culms.

Loreto: Iquitos, *Williams 8139.*—Junín: Above San Ramón, 1,400–1,700 meters, *Killip & Smith 24560.* Ranging to the Guianas and Mexico.

Cyperus sphacelatus Rottb. Descr. & Icon. 26. 1773.

A glabrous tufted annual to 6 dm. high; leaves 6 mm. wide or less, mostly shorter than the culms; umbel simple or compound, the longest rays 1.5 dm. long, but usually rather shorter than the longest bracts (3–6); spikelets linear, flat, 1–5 cm. long; scales ovate, sometimes purple-margined; stamens 3; achene ellipsoid, 3-angled.

Loreto: Lower Río Nanay, *Williams 255* (det. Gross). Tropical America and Africa.

Cyperus striatus R. & P. Fl. 1: 47. 1798. *C. collinus* Vahl, Enum. 2: 301. 1806. *C. atropurpureus* Pers. Syn. 1: 60. 1805.

Roots fibrous; culms terete, filiform, retrorsely scabrous; leaves subulate, canaliculate, ciliate below; scales ovate, carinate, dark purple; achene 3-angled, acuminate, lustrous.—Dry hills, January to March. Probably a species of *Bulbostylis.*

Junín: Tarma (*Ruiz & Pavón*).

Cyperus surinamensis Rottb. Descr. Nov. Pl. 35. 1773.

Culms a few to many dm. high, longer than the leaves, these 1.5–4 mm. wide; involucral leaves 5–7, elongate; rays 5–13, unequal, 1–1.5 cm. long; spikelets many, capitate, flat, 5–12 mm. long, 2–3 mm. wide; achene trigonous, narrowed at both ends, half as long as the yellow or brownish yellow, 3-nerved scales.

Loreto: Pebas, *Williams 1914*. Between Huallaga and Ucayali rivers, *Raimondi* (det. Gross).—San Martín: Tarapoto, *Williams 6186* (det. Gross).—Ancash: Huasca, *Dombey* (det. Clarke).—Without locality, *Ruiz* (det. Kükenthal).—Tumbes: *Raimondi* (det. Gross).—Cajamarca: Cascas, *Raimondi* (det. Gross). Widely distributed in tropical America.

Cyperus tabina Steud. ex Boeckl. Linnaea 35: 359. 1868.

Very similar to *C. Luzulae*, but the leaves usually shorter than the culms, and the umbel compound.

Puno: Tabina, *Lechler 1926*. Sandía, *Weberbauer 693* (det. Gross).—Cuzco: Along Río Pillahuata, *Pennell 13944*.

Cyperus unioloides R. Br. Prodr. 216. 1810.

Culms several to many dm. tall, from long slender rhizomes; leaves shorter, mostly 4–5 mm. broad; umbels simple, the rays 5–10 cm. long, the 4–5 bracts much longer; spikelets spicate, to 16 mm. long, 5 mm. broad, compressed, straw-color or brownish; scales ovate, inflated, the green back 3-nerved, the yellowish edges crisply undulate; achene smooth, black.—According to Clarke, this species should include *C. bromoides* Willd. and *C. angulatus* Nees. Apparently *C. tristachyus* Boeckl. Linnaea 35: 454. 1867-68, also belongs here.

Huánuco: Pampayacu, Río Chinchao, *5097*. Tropical regions.

4. ELEOCHARIS R. Br.

Heleocharis Auth.

Reference: Svenson, Contr. Gray Herb. 86. 1929 (a partial revision).

More or less tufted plants, the culms very slender and grass-like or coarser and rush-like. Leaves usually reduced to sheaths, the variously shaped culms terminating in a single several–many-flowered spikelet not subtended by an involucre.—*E. mutata* (L.) R. & S. is to be expected; it resembles *E. interstincta*, but the sharply angled culms are not septate. *E. mitrata* (Griseb.) Clarke is similar to the first, but the culms are nearly round.

Culms apparently septate, stout; perennials.

Scales firm, scarcely keeled; style long, flat.....*E. interstincta*.

Scales thin, keeled or nerved; style base spongy, beak-like.

Culms 2–2.5 mm. thick; style often 2-cleft.....*E. nodulosa*.

Culms 3–10 mm. thick; style 3-cleft.....*E. geniculata.*

Culms not at all or not obviously septate, slender.

Styles trifid; perennials except *E. retroflexa.*

Achenes striate or finely reticulate, variously colored.

Achenes yellow or pale, capped by the broadened style base.

Scales black and reddish brown; achenes and bristles subequal.....*E. albibracteata.*

Scales greenish; achenes about half as long as the bristles. *E. plicarhachis.*

Achenes black, yellowish brown, or green, the style base little enlarged.

Sheaths scarious, fugacious; achenes many-ribbed. *E. costulata.*

Sheaths indurate, apiculate; achenes smooth or faintly reticulate.....*E. Dombeyana.*

Achenes coarsely reticulate or smooth, white or pale.

Achenes coarsely reticulate and scarcely 1 mm. long. *E. retroflexa.*

Achenes usually longer, smooth, white; perennial...*E. sulcata.*

Styles bifid; annuals.

Achenes 1 mm. long; spikelets ovoid-globose.....*E. caribaea.*

Achenes 0.5 mm. long; spikelets elongate, 2–8 mm. long. *E. atropurpurea.*

Eleocharis albibracteata Nees & Meyen ex Kunth, Enum. 2: 143. 1837. *Chaetocyperus albibracteatus* Nees & Meyen in Mart. Fl. Bras. 2, pt.1: 95. 1842.

Culms 2–15 cm. high, rigid, sulcate, from elongate rootstocks; sheaths brown, rigid but scarious-margined; spikelets broadly ovate, 3–6-flowered; scales striate, shining, black and reddish brown mingled, the edges sometimes pale, the lower usually with a green midrib; achenes 1.5 mm. long, lustrous, finely reticulate as also the lower part of the style base, this as broad as the achene; bristles about as long, brownish, strongly toothed.—Illustrated, Svenson, op. cit. *pl. 189.*

Ancash: Ocros, *Weberbauer 2697* (det. Clarke).—Puno: Lake Titicaca (*Meyen*). Ecuador to Bolivia and Argentina.

Eleocharis atropurpurea (Retz.) Kunth, Enum. 2: 151. 1837; 227. *Scirpus atropurpureus* Retz. Obs. Bot. 5: 14. 1789.

Similar in habit to *E. caribaea;* scales blunt, with a broad green midrib and deep brown sides; bristles translucent, often lacking; achenes flattened, smooth, lustrous black; style base minute, flat.—Svenson remarks that the tiny shining achenes and setae mark the species well. Its wide range is curiously interrupted, especially in the Old World, as in Europe, where its occurrence is restricted to northern Italy and Lake Geneva.

Arequipa: Saline plains, Enseñada (*Günther & Buchtien 358*, det. Pfeiffer).

Eleocharis caribaea (Rottb.) Blake, Rhodora 20: 24. 1918. *Scirpus caribaeus* Rottb. Descr. 46. 1773. *E. capitata* Auth.

A fibrous-rooted annual with slender tufted culms a few cm. to sometimes a few dm. high; upper sheath firm, apiculate, spikelets much thicker than the culm, with many achenes; scales obtuse, yellowish brown or paler; bristles retrorsely barbed, about equaling the black lustrous achene; tubercle depressed-conic.—Pfeiffer, Mitt. Inst. Allgem. Bot. Hamb. 8: 38. 1929, thinks our plant is *E. flaccida* (Reichenb.) Urban, typically characterized as having a hyaline scarious-edged upper sheath, a brown achene, and as being perennial. Similar is *E. maculosa* (Vahl) R. Br. but its spikelets are chestnut-purple instead of greenish brown; also *E. capillacea* Kunth, with entire firm sheaths and 1–4 achenes.—Illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 313.

Lima: *Gaudichaud* (det. Clarke).—Huánuco: *Ruiz* (det. Clarke).—Arequipa: Cachendo, 650 meters, (*Günther & Buchtien 2058*, det. Pfeiffer as *E. flaccida*).—San Martín: Tarapoto, *Spruce 4190.*—Junín: La Merced, 700 meters, *Killip & Smith 24061.*—Without locality, *Dombey* (det. Boeckler). Argentina; Brazil.

Eleocharis costulata Nees & Meyen ex Kunth, Enum. 2: 142. 1837.

A small rigid plant 2–4 cm. high with scarious dilated sheaths and 3–6-flowered spikelets 2–3 mm. long; scales oblong, striate, green (or brown-edged); anthers 0.5 mm. long, subapiculate; achenes 1 mm. long, yellowish green, with about 12 ribs and 40 pits in longitudinal rows; style base narrow, conical; bristles 2, white, half as long as the achene, or wanting.—This has passed for the quite different *E. acicularis* (L.) R. & S. or *E. radicans* (Poir.) Kunth (as to name). The specimen cited is referred by Clarke in Herb. Dahlem to *E. acicularis* (L.) R. & S. var. *Lindheimeri* Clarke, but

it is apparently rather *E. costulata*.—Illustrated, Svenson, op. cit. *pl. 190;* Gay, Hist. Chile, Atlas *pl. 71.*

Peru: Without locality, *Dombey.* Chile; Bolivia.

Eleocharis Dombeyana Kunth, Enum. 2: 145. 1837.

Slender, 1–3 dm. high; spikelets ovate, 5–8 mm. long, 12–40-flowered; achene 1–1.5 mm. long, nearly smooth, the tubercle mucroniform, its sides nearly parallel, much less than half as wide as the body of the achene.—This description is by Weatherby, Rhodora 24: 26. 1922. *E. montana* (HBK.) R. & S., with which the plant has been confused, may be found in Peru. It has many-flowered spikelets and a reticulate achene, the tubercle pyramidal.

Peru: (*Dombey*). Bolivia and Argentina to the United States.

Eleocharis geniculata (L.) R. & S. Syst. 2: 150. 1817. *Scirpus geniculatus* L. Sp. Pl. 48. 1753. *S. elegans* HBK. Nov. Gen. & Sp. 1: 226. 1816(?). *E. elegans* R. & S. loc. cit.(?).

Culms several to many dm. high; upper truncate sheath often dark-edged; spikelets 1–3 cm. long, 4–9 mm. thick; scales obtuse; bristles 7–8, reddish, exceeding the yellowish brown achene, this about twice as long as the conical tubercle.—Illustrated, Clarke, Ill. Cyp. *pl. 39.*

Cuzco: Valle Lares, *Diehl 2446.*—Loreto: Yurimaguas, *Williams 4699.* Iquitos, *Williams 7981.* Mishuyacu, *Klug 1286* (det. Gross). Uruguay to Mexico and the West Indies.

Eleocharis interstincta (Vahl) R. & S. Syst. 2: 149. 1817. *Scirpus interstinctus* Vahl, Enum. 2: 251. 1806.

Robust like *E. geniculata*, but the upper pointed sheaths membranous, the spikelets to 4 cm. long, and the bristles 6; style often bifid, the base dark brown. Neg. 253.

San Martín: Tarapoto, *Spruce 4282.* Brazil to Texas and the West Indies.

Eleocharis nodulosa (Roth) Schult. Mant. 2: 87. 1824. *Scirpus nodulosus* Roth, Nov. Pl. Sp. 29. 1821. *Eleocharis consanguinea* Kunth, Enum. Pl. 2: 148. 1837, acc. to Clarke.

Similar to *E. geniculata*, but the spongy culms narrower, and the 4–6 bristles about equaling the olive-brown achene.

Huánuco: Mito, *1453, 3318;* southeast of Huánuco, *2140.* Tropical America.

Eleocharis plicarhachis (Griseb.) Svenson, Rhodora 31: 158. 1929. *Scirpus plicarhachis* Griseb. Cat. Pl. Cub. 239. 1866.

Stoloniferous, the slender striate culms 2 to several dm. high; spikelet 2–2.5 cm. long, 3 mm. thick; achene pale, dull, minutely reticulate, faintly striate, the tubercle ovoid-pyramidal.

Loreto: Yurimaguas, *Williams 4697* (det. Gross). Tropical America.

Eleocharis retroflexa (Poir.) Urban, Symb. Ant. 2: 165. 1900. *Scirpus retroflexus* Poir. in Lam. Encyc. 6: 753. 1804. *Eleocharis chaetaria* R. & S. Syst. 2: 154. 1817.

Culms weak, tufted, filiform-setaceous, 2–20 cm. long; upper sheath oblique, slightly inflated; spikelets 2–4 mm. long; bristles 6 or fewer or wanting, as long as the nearly white, cancellate achene; tubercle nearly half as long, brown.

Puno: *Weberbauer 1282;* 241, 242. American and Old World tropics.

Eleocharis sulcata (Roth) Nees, Linnaea 9: 294. 1834. *Scirpus sulcatus* Roth, Nov. Pl. Sp. 30. 1821.

Culms slender, 1–3 dm. long; spikelets 4–7 mm. long; bristles 3–6 (or none), pale, shorter than the white or straw-colored achene; style base bulb-like and broader than the nutlet.—*E. microcarpa* Poir., recorded from Guayaquil, is an annual with capillary culms, smaller (2–3 mm.) spikelets, and grayish achenes, the tubercle conic.

Loreto: Yurimaguas, 135 meters, *Killip & Smith 27959, 29067.*—Junín: Tarma Valley, *Weberbauer 2345* (det. Clarke). Paraguay to Colombia and Guiana.

BULBOSTYLIS Kunth

Sedges very variable in appearance but often densely tufted and with filiform culms and leaves. Sheaths often hairy. Stamens 2–3 and style 2–3-cleft, its swollen base persisting as a tubercle.—*Eulbostylis* has been proposed as a conserved name, and since most of the species are not yet transferred to *Stenophyllus*, it may with reason be accepted. *Stenophyllus* Raf. is an older name for the genus.

Culms glabrous above.

Inflorescence umbellate (sometimes reduced) or, if fasciculate-capitate, the bracts glabrous or puberulent.

Spikelets solitary.

Scales densely imbricate, the keel little if at all extended or only on the lower scales.

Scales oblong-ovate; achenes strongly wrinkled. *B. capillaris.*

Scales suborbicular-ovate; achenes smooth or faintly undulate.

Achenes 1 mm. long; scales 2 mm. broad....*B. arenaria.*

Achenes smaller and scales narrower.....*B. scabra.*

Scales lax, narrow, the green keel extended.....*B. tenuifolia.*

Spikelets fasciculate.

Scales ovate-lanceolate.....*B. junciformis.*

Scales ovate-orbicular.....*B. juncoides.*

Inflorescence capitate; bracts reddish-pubescent basally. *B. fimbriata.*

Culms and leaves pubescent, at least above.....*B. hirtella.*

Bulbostylis arenaria (Nees) Lindm. Bih. Svensk. Vet. Akad. Handl. 26, Afd. 3, No. 9: 19. 1900. *Oncostylis arenaria* Nees in Mart. Fl. Bras. 2, pt. 1: 87. 1842. *Stenophyllus arenarius* Macbr. Field Mus. Bot. 4: 167. 1929. *S. tenuifolius* Britton, var. *latesquamatus* Pfeiff. Bot. Archiv 6: 189, 193. 1924.

Similar to *B. capillaris*, but the scales roundish and the achene twice as large, faintly or not at all undulate-wrinkled.

Ancash: Santa Valley, *Weberbauer 2995* (det. Clarke); 173.—Junín: Tarma Valley (alpine form?), *Weberbauer 2383* (det. Clarke); 182. Brazil.

Bulbostylis capillaris (L.) Clarke in Hook. Fl. Brit. Ind. 6: 652. 1893. *Scirpus capillaris* L. Sp. Pl. 49. 1753. *Stenophyllus capillaris* Britton, Bull. Torrey Club 21: 30. 1894. *Stenophyllus eucapillaris ciliata* Pfeiff. Bot. Archiv 6: 187, 193. 1924. *Isolepis ciliata* Presl, Rel. Haenk. 1: 188. 1828.

An annual, the culms 1–4 dm. high, glabrous above; leaves shorter, setaceous, glabrate, the sheaths barbate at the throat; umbel rarely reduced to 1 spikelet; spikelets reddish brown or purplish, 5 mm. long; scales minutely pilose, the keel scarcely excurrent; achene pale or brownish, transversely undulate, 0.5 mm. long, the style base depressed-globose.—Var. *glaucescens* Kükenth. seems to be only a form.

Puno: Valley of Sandía, *Weberbauer 585* (det. Clarke); 238, 278.—Huánuco: (*Haenke*).—Junín: Above La Merced, *Schunke A78* (det. Gross). Tropical regions of both hemispheres.

Bulbostylis capillaris var. **coarctata** (Ell.) Macbr. Field Mus. Bot. 11: 5. 1931. *Stenophyllus capillaris* Britton, var. *coarctatus* Britton, Bull. Torrey Club 21: 30. 1894. *Scirpus coarctatus* Ell. Bot. S. C. & Ga. 1: 83. 1821. *Stenophyllus eu-capillaris coarctatus* Pfeiff. Bot. Archiv 6: 187, 193. 1924.

The umbel compound and the linear-oblong spikelets about 16-flowered.—Perhaps only a robust form.

Peru: (According to Pfeiffer). Widely distributed in America.

Bulbostylis fimbriata (Nees) Clarke in Urban, Symb. Ant. 2: 87. 1900. *Stenophyllus fimbriatus* Britton, Bull. Torrey Club 43: 446. 1916. *Scirpus fimbriatus* Boeckl. Linnaea 36: 749. 1870. *Oncostylis fimbriatus* Nees in Mart. Fl. Bras. 2, pt. 1: 88. 1842.

An annual with slender glabrous cespitose culms about 2 dm. long, and shorter setaceous leaves, the sheaths pilose at the top; head 1 cm. thick; bracts 3, usually 2–3 cm. long, reddish-pubescent at the base; scales ovate, the green keel scarcely extended, minutely hirtellous; achene smooth, brownish.—Well marked by the conspicuous basal pubescence. Neg. 11224.

Peru: Without definite locality, *Ruiz* (det. Clarke). Brazil; Martinique.

Bulbostylis hirtella (Schrad.) Nees ex Urban, Symb. Ant. 2: 166. 1900. *Isolepis hirtella* Schrad. ex R. & S. Mant. 2: 70. 1824. *Stenophyllus hirtellus* Pfeiff. Bot. Archiv 6: 190, 193. 1924. *Isolepis Langsdorfiana* Kunth, Enum. Pl. 2: 214. 1837.

Culms 1–3 dm. high, pilose above; leaves about half as long, somewhat pilose; umbel contracted, the rays 5–15 mm. long; bracts 1–3 cm. long; spikelets pedicellate, 5–7 mm. long; scales hirtellous, chestnut-brown, the keel scarcely extended; achene yellowish brown, smooth or reticulate.

Peru: Without locality, *Ruiz* (det. Clarke). Widely distributed in tropical America.

Bulbostylis junciformis (HBK.) Clarke in Urban, Symb. Ant. 2: 88. 1900. *Isolepis junciformis* HBK. Nov. Gen. & Sp. 1: 222. 1816. *Stenophyllus junciformis* Britton, Bull. Torrey Club 43: 442. 1916.

Culms 1 to several dm. long, pubescent below; umbel to 1 dm. broad, compound or simple, sometimes so contracted as to be head-like; bracts to 4 cm. long; spikelets 4–8 cm. long, chestnut or reddish brown; scales scabrous-hirtellous, the keel slightly extended; achene brown, smooth or reticulate.

Puno: Valley of Sandía, *Weberbauer 1120*; 278.—Huánuco: Prov. Huamalies, *Weberbauer 3459* (det. Clarke).—San Martín: Moyobamba, *Weberbauer 4654* (det. Clarke). San Roque, *Williams 7434*. Tropical America.

Bulbostylis juncoides (Vahl) Kükenth. ex Osten, Anal. Mus. Hist. Nat. Montevideo II. 3: 185, 187. 1931. *Schoenus juncoides* Vahl, Enum. 2: 211. 1806.

Densely tufted, with often very numerous linear-setaceous culms and leaves; sheaths somewhat ciliate at throat; spikelets densely crowded, terminal, sessile, ovate, 6–10-flowered, 3 mm. long; bracts 3, spreading; scales thin, ovate-orbicular, strongly keeled, mucronate, 3-nerved, the edges chestnut, more or less pubescent; achene minute, scarcely half as long, ovate-triangular, transversely undulate-granulate, straw-colored, lustrous; tubercle minute, depressed-globose.

Junín: In rock clefts, Tarma, *Killip & Smith 21819* (det. Gross). Brazil.

Bulbostylis scabra (Presl) Clarke, Bull. Herb. Boiss. 6: App. 1: 21. 1898. *Isolepis scabra* Presl, Rel. Haenk. 1: 187. 1828. *Stenophyllus scaber* Pfeiff. Bot. Archiv 6: 190, 193. 1924.

Resembles *B. arenaria* but the achenes only half as large.—It is open to question whether the characters upon which these several forms are separated are constant and indicate specific entities.

Peru: *Haenke*. Ecuador to Brazil and Paraguay.

Bulbostylis tenuifolia (Rudge) Macbr. Field Mus. Bot. 11: 5. 1931. *Scirpus tenuifolius* Rudge, Pl. Guian. 18. *pl. 22*. 1805. *Stenophyllus tenuifolius* Britton, Bull Torrey Club 43: 448. 1916. *Oncostylis tenuifolia* Nees in Mart. Fl. Bras. 2, pt. 1: 83. 1842. *Isolepis asperulus* HBK. Nov. Gen. & Sp. 1: 221. 1816. *Scirpus asperulus* Poir. Dict. Suppl. 5: 104. 1817.

Very slender, with narrowly ovate, mucronate scales and smooth or scarcely wrinkled achenes.

Junín: Chanchamayo Valley, *Schunke 257*.—San Martín: Moyobamba, *Weberbauer 4586* (det. Clarke). Tarapoto, *Williams 6123* (det. Gross).—Huánuco: Mito, 3,000 meters, *1455* (det. Mackenzie). American tropics.

6. FIMBRISTYLIS Vahl

Tufted sedges, various in aspect, but in ours the terete spikelets umbellate. Stamens 1–3. Style 2–3-cleft, the base often swollen but not persistent on the lenticular or triangular achene.

Bracts 3 to many, more or less elongate; style bifid.

Spikelets solitary or, if subcapitate, the leaves much shorter than the culms.

Spikelets usually less than 10 mm. long; achene striate. *F. diphylla.*

Spikelets about 11 mm. long; achene faintly reticulate. *F. spadicea.*

Spikelets subcapitate; leaves setaceous, often exceeding the culms. *F. Vahlii.*

Bracts usually 2, much shorter than the umbels; style trifid. *F. complanata.*

Fimbristylis complanata (Retz.) Link, Hort. Berol. 1: 292. 1827. *Scirpus complanatus* Retz. Obs. Bot. 5: 14. 1789.

Glabrous, the slender culms somewhat 4-angled above, 2–6 dm. high; leaves 2–6 mm. wide, often 1–2 dm. long; umbels compound or decompound, the linear-oblong spikelets 5–10 mm. long, in small umbels; scales brown, ovate-lanceolate; achene angled, yellowish brown, striate and minutely tuberculate.—Related species with trifid styles to be expected include *F. miliacea* (L.) Vahl, with nearly globose spikelets 2–4 mm. long, *F. autumnalis* (L). R. & S. with angled culms and spikelets 6 mm. long, and possibly *F. obtusifolia* (Lam.) Kunth, with the spikelets in fascicled spikes. Kükenthal treats *F. complanata* as a variety of *F. autumnalis*, apparently rightly. Neg. 252.

Arequipa: Saline plain, Enseñada (*Günther & Buchtien*, det. Pfeiffer).—Without locality (*Dombey*, det. Clarke); (*Ruiz*). Tropics of both hemispheres.

Fimbristylis diphylla (Retz.) Vahl, Enum. 2: 289. 1806. *Scirpus diphyllus* Retz. Obs. Bot. 5: 15. 1789.

A more or less pubescent or sometimes glabrous perennial, the tufted culms 1–6 dm. high; bracts sometimes short; spikelets solitary, 5–10 mm. long, to 4 mm. thick; scales ovate, acute; style pilose below; achene biconvex, strongly ribbed and reticulate.—By Kükenthal this is regarded as a variety of the Old World *F. annua* R. & S. The somewhat similar *F. squarrosa* Vahl has 3–5-nerved scales, recurved-mucronate.—Illustrated, F. M. Bailey, Weeds Queensland 215.

Huánuco: Huánuco, 2,100 meters, *3509*.—Loreto: Puerto Arturo, in pasture, *Williams 5114*. Iquitos, 100 meters, *Killip & Smith*

27269.—San Martín: Tarapoto, *Williams 6185.* San Roque, *Williams 7687.* Generally distributed in tropical America, extending to the southern United States; Old World tropics.

Fimbristylis spadicea (L.) Vahl, Enum. 2: 294. 1806. *Scirpus spadiceus* L. Sp. Pl. 51. 1753.

A perennial with wiry culms sometimes 1 meter high, the basal involute-margined leaves about half as long, their broad bases lustrous brown; involucre leaves 3–4, often longer than the simple or compound umbel; spikelets about 1 cm. long and 4 mm. thick, the lustrous brown scales ovate, apiculate, twice as long as the obovate biconvex cancellate achene.—The related *F. ferruginea* (L.) Vahl and *F. spathacea* Roth have very short leaves and the former has puberulent scales, the latter glabrous ones.—Illustrated, Field Mus. Bot. 3: 81 (fruit).

Cajamarca: *Raimondi* (det. Gross). Widely distributed in tropical and subtropical America.

Fimbristylis Vahlii (Lam.) Link, Hort. Berol. 1: 287. 1827. *Scirpus Vahlii* Lam. Ill. 1: 139. 1791.

A slender annual with a capitate inflorescence subtended by many setaceous bracts; scales mucronate; achene lightly striate.—Illustrated, Britton & Brown, Ill. Fl. ed. 2. 1: 321.

Peru: Northern Peru (Clarke in Urban, Symb. Ant. 2: 80. 1900). South America north to the United States.

7. SCIRPUS [Tourn.] L. Bulrush

Annuals or perennials, often tufted, the leaves completely reduced to basal sheaths or more or less strongly developed. Inflorescence terminal or sometimes apparently lateral and with or without one or more involucral bracts. Achene often pointed but style base not enlarged.—The following key, based largely on descriptions, very doubtfully holds for the low cespitose species which, so far as Peruvian material is concerned, appear to be reducible to *S. cernuus, S. nigricans, S. inundatus, S. acaulis,* and *S. deserticola. S. fragrans* R. & P. is omitted from the key; it is doubtfully a *Scirpus. S. nevadensis* Wats., nearest *S. rigidus,* according to Clarke, may occur; it has a terminal inflorescence of 1–8 heads and a bifid style.

Spikelets 1 to several, terminal or lateral and congested.

Low plants, a few cm. to about 1 dm. high or, if taller, the leaf sheaths bladeless or the culms setaceous.

Leaf sheaths bladeless; perennial.....*S. pauciflorus.*

At least one sheath with a developed leaf.
Plants fibrous-rooted; a nearly leafless annual....*S. cernuus.*
Plants perennial, the leaves usually many.
Bristles 3–6.
Leaves grooved, linear.
Bristles papillose-dentate.....*S. Hieronymi.*
Bristles scabrous.....*S. deserticola.*
Leaves plane, lanceolate at base.....*S. acaulis.*
Bristles none.
Culms setaceous.
Leaves developed; styles trifid.....*S. inundatus.*
Leafless; styles bifid.....*S. nigricans.*
Culms rigid.....*S. atacamensis.*
Tall plants, usually 2 to many dm. high.
Inflorescence terminal, usually a solitary spikelet 6–8 mm. long. *S. rigidus.*
Inflorescence laterally congested; spikelets usually several and longer or, if terminal, numerous.
Culms sharply angled.
Culms smooth; involucral leaf solitary.....*S. americanus.*
Culms scabrous; involucral leaves 3–4.....*S. asper.*
Culms terete except at apex.
Spikelets ovate, about 1 cm. long.....*S. conglomeratus.*
Spikelets cylindric.
Spikelets about 2 cm. long.....*S. limensis.*
Spikelets 6–14 mm. long.....*S. lomanus.*
Spikelets many, in a compound umbel.
Plants tall, leafless.
Spikelets 6–10 mm. long.....*S. californicus.*
Spikelets 2–3.5 mm. long.....*S. peruvianus.*
Plants medium sized, leafy.
Scales 1-nerved.....*S. asper.*
Scales many-nerved.....*S. cubensis.*

Scirpus acaulis Philippi, Linnaea 29: 78. 1857.

Very low, scarcely 2 cm. high; leaves rigid, recurving, narrow, grooved above, 12–16 mm. long; spikelets 3–4, oblong, densely aggre-

gate in an ovate spike 6–8 mm. long and 5 mm. thick, many-flowered; scales oblong, acute, green with thin, pale or brownish edges, the lower involucrate, mucronate.

Junín: Between Tarma and La Oroya, 4,300 meters (*Weberbauer 223*). Chile.

Scirpus americanus Pers. Syn. 1: 68. 1805. *S. pungens* Vahl, Enum. 2: 255. 1806. *S. monophyllus* Presl, Rel. Haenk. 1: 193. 1828.

Rigid and rather stout, from long rootstocks, the sharply angled culms sometimes 1 meter tall; leaves 1–3-keeled, linear, shorter than the culms; spikelets usually several, oblong-ovoid, acute, about 1 cm. long, in a falsely lateral head, the slender involucral leaf often 8 cm. long or longer; scales broadly ovate, brown, emarginate or cleft, awned by the extended midrib, the edges scarious; bristles 2–6, barbed, shorter than or equaling the plano-convex smooth mucronate achene; stamens 3.

Cajamarca: *Raimondi* (f. *monostachys* Asch. & Graebn., det. Gross).—Lima: Callao-Lorenzo, *Gaudichaud*.—Without locality, *Ruiz* (det. Clarke).—Arequipa: Near Mejía (*Günther & Buchtien*, det. Pfeiffer). Widely distributed in America.

Scirpus asper Presl, Rel. Haenk. 1: 194. 1828.

Leaves rigid, scabrous; umbel dense, with many unequal rays; spikelets cylindric, congested, dark brown; scales 1-nerved, carinate, acuminate-mucronate; style trifid; bristles 6.

Peru: *Raimondi*. Chile.

Scirpus atacamensis Boeckl. Linnaea 36: 482. 1869–70.

Densely cespitose from long rhizomes; culms and leaves only a few cm. high, subequal, the former subterete and densely clothed below with the old leaf sheaths; leaves pale green, rigid, striate, convex, compressed at apex and obtuse but mucronulate, 1 mm. wide at the middle; spikelets 10–12-flowered, 8 mm. long and 6 mm. thick; scales oblong, obtuse, yellowish, pellucid-membranous, the upper narrower, the lowest elongate, equaling the spikelet, many-nerved; achene compressed-subangulate, rotund-obtuse, pale olive; bristles none; style trifid.

Junín: Above Yauli, 4,500 meters, *Weberbauer 297;* 222. Chile.

Scirpus californicus (C. A. Mey.) Britton, Trans. N. Y. Acad. Sci. 11: 79. 1892. *Elytrospermum californicum* C. A. Mey.

Mém. Sav. Etrang. St. Pétersb. 1: 201. *pl. 2.* 1830. *S. riparius* Presl, Rel. Haenk. 1: 193. 1828. *S. tatora* Kunth, Enum. 2: 166. 1837. *S. riparius* var. *tereticulmis* Clarke, Bot. Jahrb. 30: Beibl. 68: 36. 1901.

Tall, often 2 meters high, the leaves reduced to basal sheaths; involucral bract short, subulate; umbel compound, the many oblong acute spikelets 6–10 mm. long and mostly stalked; scales brown, ovate, the midnerve extended as a mucro; bristles as long as or longer than the achene, plumose below and barbed above; stamens 2–3; styles 2-cleft; achene plano-convex, pale, pointed, articulate.—Remarkable boats and even sails are constructed of this tall species. It is also sold in the markets in bundles under the name "lomillo" and used, after wetting, as a substitute for rope. Neg. 257.

Puno: Lake Titicaca basin, *Weberbauer 1364;* 185 and ill.; *Meyen 89.* Argentina, and north to the United States. "Totora," "tortora."

Scirpus cernuus Vahl, Enum. 2: 245. 1806. *S. setaceus* L. var. *pygmaeus* Boeckl. Linnaea 36: 502. 1869–70. *Isolepis brachyphylla* Presl, Rel. Haenk. 1: 187. 1828, acc. to Kunth. *I. pygmaea* Kunth, Enum. 2: 191. 1837.

A tufted annual with fibrous roots and very slender culms, leafless except for one short filiform blade from the upper sheath, or this even undeveloped; spikelet solitary, ovoid, 2–5 mm. long, the bract 2–20 mm. long; scales broadly ovate, obscurely keeled, brownish; bristles none; style 3-cleft; achene sharply angled, smooth, brown, under 2 mm. long.

Junín: Tarma Valley, 3,300 meters, *Weberbauer 2344* (det. Clarke); 183.—Huánuco: Mito, 3,000 meters, *1689.*—Arequipa: Cachendo (*Günther & Buchtien,* det. Pfeiffer). South America to British Columbia; Old World.

Scirpus conglomeratus HBK. Nov. Gen. & Sp. 1: 227. 1816. *S. nodosus* Rottb. Descr. & Icon. 52. *pl. 8, f. 3.* 1773, as to the South American plant.

Culms 1–2 meters high, terete except above, there obtusely angled; spikelets typically 8–12, sessile in a lateral-appearing cluster, ovate, obtuse, many-flowered, about 1 cm. long; scales elliptic, acuminate-aristate, ciliate, white; achene lenticular, acuminate-mucronate; bristles 6; style bifid.—This species appears to be distinct from *S. americanus* Vahl, to which it has been referred. For one character,

it has terete culms. In this respect it resembles the closely related *S. limensis*, which is described as having much longer spikelets. My number *5933* agrees with the descriptions except that the spikelets are fewer (1–6). My *753*, according to Gross, is *S. americanus*. A serviceable light-weight hat is made from the culms.

Libertad: Near Trujillo, *Humboldt.*—Lima: Lurín, *5933*. Viso, *753* (a form with 1–2 spikelets). "Totora."

Scirpus cubensis Poeppig & Kunth in Kunth, Enum. 2: 172. 1837.

Similar to *S. asper*, but the leaves more flaccid, the style bifid, and bristles lacking.—The Peruvian plant is the less robust form, var. *gracilipes* Boeckl.

Loreto: Iquitos, *Killip & Smith 26919* (det. Gross). Tropical America and Africa.

Scirpus deserticola Philippi, Fl. Atac. 53. 1860. *S. semisubterraneus* Boeckl. Linnaea 36: 495. 1869–70.

Densely cespitose, scarcely 5 cm. high, from filiform rhizomes; culms about 2.5 cm. high, below the apex obscurely angled, glandular-punctate, densely leafy below; leaves 6–8 mm. long, linear-obtuse, grooved above, punctate-scabrous on the margins; head terminal, 4–5 mm. thick, the 1–3 spikelets oblong, 4–6-flowered; scales ovate-oblong, carinate, scarcely mucronate, glandular-punctate, the lower sterile; ovary convex-angled, puncticulate; style smooth, trifid; bristles 6; stamen 1.

Puno: Agapata (*Lechler 1977*). Chile.

Scirpus fragrans R. & P. Fl. 1: 47. 1798.

Culms 2–3 dm. high, filiform, terete, striate, pubescent, from a fascicle of fine fragrant roots; leaves half as long, somewhat sulcate, setaceous, pubescent; spikes 6, ovate, terminal, pedicellate, umbellate; bractlets many, setaceous, the outer twice as long as the spikes; scales ovate, carinate, purplish; style filiform, trifid; achene 3-angled, acuminate, naked, glabrous.

Huánuco: Pillao (*Ruiz & Pavón*).

Scirpus Hieronymi Boeckl. Cyp. Nov. 1: 18. 1888.

Loosely cespitose, about 1 dm. high, from often much-branched, densely leafy bases; culms about 2.5 cm. high, sulcate, as the narrow leaves below; sheaths shortly auricled; spikelet single, bractless, turbinate, very obtuse, 6–9-flowered, 8 mm. long; scales chartaceous-

rigid, spreading at the tip, acutish, few-nerved, brownish; bristles typically none; achene obtuse, 4-sulcate, straw-colored, lustrous; style trifid.—Near *S. atacamensis*, and the Peruvian plants, at least, doubtfully distinct. According to Clarke (note in herb.), this species has commonly 4 bristles, notwithstanding the original diagnosis.

Junín: Yauli, 4,500 meters, *Weberbauer 298;* 222. Extending to Argentina.

Scirpus inundatus (R. Br.) Spreng. Syst. 1: 207. 1825. *Isolepis inundata* R. Br. Prodr. 222. 1810.

Culms setaceous; leaf sheaths bladeless; spikelets subterminal, 2–6, glomerate, ovate; scales obtuse, nerveless; style bifid; achene sublenticular, smooth.—The scales in my specimens are very pale, as sometimes in Old World plants.

Huánuco: Mito, 3,000 meters, *1690.* Between Río Marañón Valley and valley of the Monzón, *Weberbauer 3717* (det. Clarke); 254. Western South America; New Zealand; Australia; Malaysia.

Scirpus limensis Clarke, Kew Bull. Misc. Inf. Add. Ser. 8:29. 1908.

About 2.5 dm. high, the culms terete to the triangular apex; leaves about a third as long, narrow, convolute; spikelets 1–3, crowded in a head, cylindrical, 2 cm. long and 3 mm. thick; bract suberect, slightly longer than the inflorescence; scales obtuse, apiculate; bristles 4, long-scabrous, exceeding the obovoid, pointed, smooth, dark olive achene; style bifid.—Differs from *S. americanus* in the terete culms and elongate spikelets. Neg. 256.

Lima: Lima, *Cuming 1057; d' Urville.*

Scirpus lomanus Pfeiff. Mitt. Inst. Allgem. Bot. Hamb. 8: 39. 1929.

Similar to *S. limensis*, but often lower; spikelets solitary, or sometimes 2; achene obovate-trigonous, black or gray, lightly tuberculate.

Arequipa: Saline plains near Mejía (*Günther & Buchtien 359*).

Scirpus nigricans (HBK.) Poir. Encycl. Suppl. 5: 104. 1817. *Isolepis nigricans* HBK. Nov. Gen. & Sp. 1: 220. 1816. *S. angachillensis* Boeckl. Linnaea 36: 496. 1869–70.

Culms setaceous, 2.5–4 cm. high, the few to many plane leaves as long or shorter; spikelets 2–3, lateral, ovate, terete, obtuse, 6–14-flowered, 3 mm. long; involucral leaves 2, the lower 6–12 mm. long,

the other scale-like; scales ovate, green-carinate, the sides variegated with reddish brown; achene minute, angled, mucronulate, faintly reticulate.—Suggests *S. inundatus*, but leafy and the styles trifid.

Puno: Tatanara, *Lechler 2655*.—Lima: Callao (*HBK.*). Chile.

Scirpus pauciflorus Lightf. Fl. Scot. 2: 1078. 1777.

Very doubtfully correctly included (as by Clarke) in the Andean flora, since it is a Canadian Zone plant. It has slender triangular leafless culms to 2.5 dm. high and an oblong terminal spikelet not subtended by a bract; its achene is beaked and finely reticulate.

Junín: Yauli, 4,500 meters (*Weberbauer 222*). North America; Europe; Chile.

Scirpus peruvianus Pfeiff. Mitt. Inst. Allgem. Bot. Hamb. 8: 40. 1929.

Much like *S. californicus;* culms terete or compressed-angled; bract 8–25 cm. long; bristles minutely ciliate; achene rusty gray, faintly reticulate.

Arequipa: Near Mejía (*Günther & Buchtien 1705*).

Scirpus rigidus Boeckl. Linnaea 36: 492. 1869–70.

Entire plant rigid, the many clustered culms 2–2.5 dm. high, subterete, sulcate-striate, scabrous especially above, with 2–3 leaves at base; leaves shorter, grooved, setaceous, scabrous-margined; spikelet terminal, oblong, 6–8 mm. long, 8–12-flowered; bract erect, setaceous, twice as long; scales lax, oval, obtuse, the thick back greenish yellow, the thin edges brown; achene plano-convex-angled (young); style deeply trifid; stamens 2; bristles none.

Puno: Agapata (*Lechler 2064*). Between Poto and Sandía, *Weberbauer 1021*.—Ancash: *Weberbauer 2774*.—Junín: La Oroya, *Weberbauer 2610*.

8. FUIRENA Rottb.

Perennials with leafy triangular culms; spikelets many-flowered, terete, in terminal and axillary clusters; scales spirally imbricate, awned; flowers perfect; perianth of 3 stalked and often awned scales, usually alternating with as many bristles; style deciduous, 3-cleft; achene stalked or almost sessile, acutely 3-angled, smooth.

Fuirena incompleta Nees in Mart. Fl. Bras. 2, pt. 1: 107. 1842.

Plants erect, slender, low, with narrow blades; spikelets rather dark, mostly 5–7 mm. long, densely clustered.

Huánuco: Mito, 2,700 meters, grassy swamp, *3321*. Brazil.

9. HYPOLYTRUM L. C. Rich.

Stout perennials with leafy triangular culms bearing congested or panicled and diffuse corymbs or fascicles. Involucral bracts elongate. Spikelets many-flowered, the flowers all hermaphrodite. Scales imbricate, persistent, exceeded by the long achene, beaked by the (bifid) style base.

Hypolytrum sylvaticum Poepp. & Kunth in Kunth, Enum. Pl. 2: 270. 1837.

Plants 1–2 dm. high, glabrous except for the longer 3-nerved scabrous-margined leaves 5–10 mm. broad; corymbs geminate, sessile; spikelets 4 mm. long, the scales ovate, acute, carinate-convex, pale with reddish lines, the inner hyaline and slightly scabrous; ovary obovate-oblong.—*H. strictum* Poepp. & Kunth, taller, with 3–4 approximate sessile spikes, and *H. amplum* Poepp. & Kunth, with a much-branched panicle, the solitary spikes pedicellate, are to be expected.

Loreto: La Victoria, *Williams 2959* (det. Gross). Brazil.

LIPOCARPHA R. Br.

Annuals or perennials with rigid leaves crowded at the base of subangled culms, and ovate spikelets (usually several) crowded into a bracted terminal head. Scales imbricate, the inner persistent and including the beakless compressed achene.

Lipocarpha Sellowiana Kunth, Enum. 2: 267. 1837.

Culms rigid, the shorter leaves grooved on the inner face and scabrous at the tip; bracts 3; spikes 5–6; scales reddish brown, with green backs, many-nerved; achene brownish, faintly puncticulate-scabrous.—Nearly *L. argentea* R. Br., with white-lineate few-nerved scales.

Cajamarca (?): *Raimondi*. Brazil.

DIPLASIA L. C. Rich.

The single species is a robust perennial with broad leaves, sharply denticulate-scabrous on the margins, and with large umbellate-paniculate spikes on long peduncles.

Diplasia karataefolia L. C. Rich. ex Pers. Syn. Pl. 1: 70. 1805.

Leafy triangular culms sometimes nearly 2 meters high, often 1 meter; leaves about as long, 2.5–6 cm. wide; flowers 6–9 or more

in each spikelet, the terminal one pistillate; scales and large nutlets (to 5 mm. long) brown.—Specimens all determined by Gross.

Loreto: Puerto Bermúdez, *Killip & Smith 26420.* Iquitos and vicinity, *Klug 1449; Williams 3637.* Río Nanay, *Williams 1050, 1262.* Amazon Valley and the Guianas.

12. DICHROMENA Michx.

Rynchospora Vahl, Enum. 2: 229. 1806. *Rhynchospora* Auth.

Sedges very various in aspect, largely because of the great variety in the disposition of the spikelets, these sometimes in solitary or in several more or less obviously leafy-bracted heads, again openly placed in umbels or in corymbose panicles that often are irregularly developed, and sessile or peduncled. Culms leafy, at least toward the base. Bristles none to many.—Besides the following species (keyed or mentioned in the text), there are four little plants with filiform or very slender culms and leaves that probably will be found: two are annuals, *D. micrantha* (Vahl) Kunth and *D. setacea* (Berg.) Macbr., with no bristles; the former has spikelets only 1–2 mm. long, the latter spikelets 3–6 mm. long. The perennials, *D. Linkii* Macbr. (*R. tenuis* Link) and *D. filiformis* (Vahl) Kunth, are distinguished by their smooth filiform culms (not scabrous). The former has spikelets 4 mm. long and rugose achenes and the latter spikelets 8–12 mm. long and smooth achenes.

Inflorescence a solitary, often leafy-bracted head.

Bracts soft, much exceeding the inflorescence, ciliate or glabrous.

Achenes transversely undulate; bracts often white at base.

Spikelets brown.....*D. radicans.*

Spikelets white.

Bracts white at base; spikelets 7–9 mm. long....*D. ciliata.*

Bracts green; spikelets shorter.....*D. globosa.*

Achenes punctate; bracts green.....*D. blepharophora.*

Bracts scarcely longer than the inflorescence or, if longer, scabrous or rigid and coarse.

Bracts shorter than the inflorescence or equaling it or, if longer, the bracts subequal.....*D. alta.*

One bract much longer, the other much shorter. *D. semiinvolucrata.*

Inflorescence compound or simple but not monocephalous (except rarely when reduced, as sometimes in *D. amazonica*).

Spikelets densely capitate, the globose heads more or less panicled, or cylindric and Carex-like.

Heads globose.

Leaves distinctly scabrous; achenes brown.....*D. exaltata.*

Leaves glabrous or nearly so; achenes white, black-dotted. *D. aberrans.*

Heads ovoid-cylindric.....*D. cariciformis.*

Spikelets sometimes fasciculate but not in globose or Carex-like heads.

Bristles tufted-setulose at apex; corymbs 10 to many, with divaricate branches; spikelets globose or subglobose.

Corymbs 1–1.5 dm. broad; leaves 6–9 mm. broad.*D. Pearcei.*

Corymbs about 3 cm. broad; leaves to 4 cm. broad. *D. peruviana.*

Bristles (if present) equally scabrous or barbellate from base to apex; corymbs usually fewer or the spikelets merely in panicles or fascicles or solitary; spikelets rarely turbinate-globose.

Leaves setaceous, filiform, or linear, rarely to 3 mm. wide.

Leaves setaceous; style long, its branches shorter than its base.

Spikelets 4 mm. long; bristles none.....*D. dissitiflora.*

Spikelets 5–6 mm. long; bristles long.....*D Lechleri.*

Leaves linear; style short, its branches about as long as its base.

Scales obtuse; bristles short.....*D. brunnea.*

Scales acuminate; bristles long.....*D. glauca.*

Leaves linear-lanceolate, 5–15 (rarely 3–20) mm. wide.

Leaves mostly narrower than 10 mm.; bristles shorter than or equaling the achene, or only 4.

Spikelets dark brown or olive, congested in 1–7 panicles or corymbs or in sessile solitary fascicles.

Leaves mostly under 5 mm. wide, smooth or pilose, little if at all scabrous.

Spikelets about 5 mm. long; style long. *D. Weberbaueri.*

Spikelets 3 mm. long; style short.....*D. glauca.*

Leaves mostly 5–10 mm. wide, harshly scabrous, at least above.

Culms obtusely angled; spikelets in 1–several panicles or corymbs.

Terminal panicle about 3 cm. long and wide or smaller, often sterile at tip . . . *D. macrochaeta.*

Terminal panicle about twice as long (typically), not sterile at tip . . . . . *D. Ruiziana.*

Culms acutely angled, deeply sulcate; spikelets fasciculate . . . . . *D. amazonica.*

Spikelets straw-colored, in open corymbs.

Leaves about 4 mm. wide; spikelets few to many. *D. polyphylla.*

Leaves broader; spikelets very numerous . *D. Mandonii.*

Leaves mostly much broader than 10 mm.; bristles, at least some of them, usually longer than the achene.

Bristles of unequal length; inflorescence bright golden brown, dense . . . . . *D. locuples.*

Bristles about equal or all longer than the achene; inflorescence of several dull or pale or dark brown corymbs.

Inflorescence not strictly terminal nor leafy-bracted.

Culms slightly scabrous; corymbs rather compact, the few-flowered spikelets many . . *D. corymbosa.*

Culms usually smooth; corymbs lax, widely branched, the spikelets few.

Leaves often 2.5–3.5 cm. wide, scabrous on the margins; spikelets many-flowered. *D. umbraticola.*

Leaves rarely 2 cm. wide, scabrous on the nerves; spikelets few-flowered . . . . . *D. Kuntzei.*

Inflorescence terminal, leafy-bracted . . . . . *D. Killipii.*

Dichromena aberrans (Clarke) Macbr. Field Mus. Bot. 11: 6. 1931. *Rynchospora aberrans* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 35. 1908.

Apparently rather similar to *D. exaltata* in aspect, but nearly glabrous, with distant, racemosely disposed heads and broadly obovate, lustrous-white achenes with black dots, the beak black.—In the type, bristles are lacking.

Arequipa: Cachendo (*Günther & Buchtien 2057*, det. Pfeiffer). Brazil.

Dichromena alta (Boeckl.) Macbr. Field Mus. Bot. 4: 166. 1929. *Rynchospora globosa* R. & S. Syst. 2: 89. 1817, not *D. globosa* R. & S. op. cit. 90. *Chaetospora globosa* HBK. Nov. Gen. & Sp. 1: 230. 1816. *R. alta* Boeckl. Cyp. Nov. 2: 20. 1890 (acc. to Clarke).

Culms several dm. high, leafy below, bearing a capitate inflorescence 1–2 cm. broad that is scarcely exceeded by the ovate, obtuse, mucronate, brown and rigid bracts; leaves nearly as long, to 5 mm. broad; spikelets 6–10 mm. long; scales about 8, only 2–3 fertile; setae 5–6, ciliate, the apex scabrous, little shorter than the achene, the beak of this about a third as long.—*D. barbata* (Vahl) Macbr. usually has longer bracts and its achene is scarious-winged. *D. Schoenus* Macbr. (*Scirpus cephalotes* L.) has a head-like panicle to 3 cm. broad and larger, subtended by 1–3 bracts as much as 2 dm. long, and long-beaked reticulate achenes shorter than the bristles. Both species doubtless will be found.

Huánuco: Monzón, 1,200 meters, *Weberbauer 3465*. Grass steppes of eastern Peru (*Weberbauer 77, 277, 291*).—San Martín: Moyobamba, *Weberbauer 4591* (det. Clarke). San Roque, *Williams 7664* (det. Gross).—Puno: Sandía region, *Weberbauer 1135*. South America to Mexico.

Dichromena amazonica (Poepp. & Kunth) Macbr. Field Mus. Bot. 11: 6. 1931. *Rynchospora amazonica* Poepp. & Kunth in Kunth, Enum. 2: 292. 1837.

Culms slender, triangular-sulcate, 1 to several dm. tall, scabrous as the longer (4–10 mm. broad) leaves beneath and on the margins; inflorescence fascicles sessile and solitary, bracteate or partly peduncled; spikes 6 mm. long, acuminate, 1-flowered; scales many, imbricate, brown, glabrous, the fertile acute, the lower sterile ones mucronate; bristles 5–6, scabrous, shorter than the obovate lenticular lustrous-brown puncticulate achene, this nearly equaled by the pale beak. Neg. 11120.

Cajamarca: *Raimondi*.—Loreto: Iquitos, *Williams 3674* (det. Gross). Alto Río Itaya, *Williams 3437* (det. Gross). Brazil.

Dichromena blepharophora Presl, Rel. Haenk. 1: 351. 1830. *D. ciliata* Presl, op. cit. 197. *pl. 32*. 1828, not Vahl.

Like *D. ciliata*, but the bracts green, the spikelets only 4 mm. long, the scales acuminate, and the achenes puncticulate.

Peru: (*Haenke*).

Dichromena brunnea Boeckl. ex Macbr. Field Mus. Bot. 4: 166. 1929. *Rynchospora brunnea* Boeckl. Linnaea 37: 593. 1873.

Culms slender but rigid, to several dm. tall, angled; leaves linear, acuminate, subcarinate, scarcely denticulate, the lower 1.5–2 dm. long and 2–3 mm. broad; corymbs 2–3, strict, erect, distant, the terminal 6–8-branched, 3.5–5 cm. long, the shorter lateral ones on slender peduncles nearly 8 cm. long; spikelets oblong-ovate, 4 mm. long, developing 1 turgid, faintly rugulose, lustrous, chestnut-brown achene with a short-conical beak, its base suborbicular; scales chartaceous, broadly oblong, brown, mucronulate; bristles much shorter than the achene.

Peru: (*Ruiz*).

Dichromena cariciformis (Nees) Macbr. Field Mus. Bot. 11: 42. 1931. *Rynchospora cariciformis* Nees in Mart. Fl. Bras. 2, pt. 1: 145. 1842. *R. trichophora* Nees, loc. cit., fide Gross.

Especially in fruit, recognizable by the cylindric, little interrupted spike, simulating some species of *Carex;* culms angled, smooth or slightly scabrous, exceeded by the leaves, the latter 7–8 mm. wide, scabrous on margins and keel and long-ciliate near the base; peduncle and rachis hirsutulous; bracts setaceous; spike brown, 1–several cm. long; scales ovate, obtuse, mucronate; achenes straw-colored, turgid-lenticular, with the slender beak (as long as the body) subequal to the bristles. Neg. 11126.

Loreto: San Antonio, Río Itaya, *Williams 3457.* Brazil.

Dichromena ciliata Vahl, Enum. 2: 240. 1806. *D. pulchella* Poepp. & Kunth in Kunth, Enum. Pl. 2: 277. 1837. *Rynchospora ciliata* Kükenth. Bot. Jahrb. 56: Beibl. 125: 16. 1921.

Culms slender, 3-angled, usually less than 7 dm. high, from short rootstocks with many roots; leaves smooth or pubescent, mostly shorter, 2–4 mm. wide; involucral leaves 4–6, usually pilose-ciliate toward the whitened base; spikelets 3–15, subspicate or capitate, 6–7 mm. long; scales whitish; achenes broad, transversely undulate.—Illustrated, Clarke, Ill. Cyp. *pl. 63* (fruit).

San Martín: Moyobamba, *Weberbauer 4653* (det. Clarke); 291. Tarapoto, *Williams 5700, 5838.*—Huánuco: Cochero, *Poeppig.* —Junín: Hacienda Schunke, *Schunke A75* (det. Gross). Tropical America.

Dichromena corymbosa (L.) Macbr. Field Mus. Bot. 11: 6. 1931. *Scirpus corymbosus* L. Cent. Pl. 2: 7. 1756. *Rynchospora aurea* Vahl, Enum. 2: 229. 1806. *R. corymbosa* Britton, Trans. N. Y. Acad. Sci. 11: 84. 1892.

Stout and tall, without stolons; leaves 8–15 mm. wide; terminal corymb compound, the lateral remote, axillary; spikelets usually clustered, 6–10 mm. long; scales mucronate; bristles 6; style subentire; achene 2–3 mm. long, smooth or rugose, the beak long, conic, sulcate.—The similar *D. gigantea* (Link) Macbr. has 12–30 spikelets in a cluster and a sulcate achene; *D. triflora* (Vahl) Macbr. is stoloniferous and the beak of the achene is longer than the body.

Loreto: Near Iquitos, *Williams 1400, 1456* (det. Gross).—San Martín: San Roque, *Williams 7122* (det. Gross). Old and New World tropics.

Dichromena dissitiflora Steud. ex Macbr. Field Mus. Bot. 4: 166. 1929. *Rynchospora dissitiflora* Steud. ex Boeckl. Linnaea 37: 598. 1873.

Culms few, subflexuose, 2 dm. high, setaceous-filiform as also the shorter spreading denticulate leaves; peduncles axillary, remote, the lower 1 or 2 sessile, oblong, acute, terete, 4 mm. long; scales chartaceous, ovate-lanceolate, mucronate; achene rotund-obtuse, attenuate to a stipe-like base, striolate and reticulate, lustrous brown, its conic-acute beak a little longer; bristles none.

Puno: Tatanara (*Lechler 2525a*).

Dichromena exaltata (Kunth) Macbr. Field Mus. Bot. 8: 113. 1930. *Rynchospora exaltata* Kunth, Enum. Pl. 2: 291. 1837.

Culms angled, branched above; leaves rigid, the keel and margins scabrous; heads globose, pale brown, corymbose (5–7) at the tips of the branches and branchlets, unequally peduncled; involucral leaves 4–5; spikelets lance-subulate, 4–5-flowered, all the flowers staminate except the lowest; achene 1.5 mm. long, subrotund, turgid-lenticular, undulate-rugulose, brown with an ashy beak longer than the body; bristles 2–3 or none.—The similar *D. cyperoides* (Sw.) Macbr. no doubt occurs. Its heads are more laxly corymbose-paniculate; it develops 6 bristles and its achene is scarcely 1 mm. long.—Some forms of *D. amazonica* might be keyed here; it is unbranched with one sessile head and 1–3 peduncled ones. Neg. 11131.

Junín: Hacienda Schunke, La Merced, *5750*. Near La Merced, *Killip & Smith 23883* (det. Gross). Brazil.

Dichromena glauca (Vahl) Macbr. Field Mus. Bot. 4: 166. 1929. *Rynchospora glauca* Vahl, Enum. 2: 233. 1806. *R. ferruginea* R. & S. Syst. 2: 85. 1817.

Slender or rather stout, sometimes 9 dm. tall, from short and thick rootstocks; leaves 2–4 mm. broad, shorter than the culms; corymbs slender-stalked, axillary, 1–3, distant, loose, 1–3 cm. broad; spikelets ovoid, 3 mm. long, with 1–2 achenes; bristles about 6, barbed above, equaling the achene or a little longer; achene lenticular, cross-wrinkled, its conic tubercle a third to a half as long.—*D. Marisculus* (Lindl. & Nees) Macbr. has leaves to 7 mm. broad, pilose-based bristles scabrous above, and a short-stipitate achene. *D. distans* (Michx.) Macbr. has flat leaves, dense, usually smaller corymbs, and a smooth achene. *D. cymosa* (Ell.) Macbr. is nearly *D. glauca*, but the achenes are shorter than the bristles.

Huánuco: (*Haenke*). Mito, grasslands, 3,000 meters, *1452*, *1776* (det. Killip). Huamalies, *Weberbauer 3453* (det. Clarke).—Amazonas: Chachapoyas, *Weberbauer 4394*.—San Martín: Moyobamba, *Weberbauer 4593* (det. Clarke). San Roque, *Williams 7666*.—Loreto: Iquitos, *Williams 3778* (det. Clarke). Río Huallaga, *Williams 4042* (det. Gross).—Puno: Sandía, *Weberbauer 691*. Warmer regions of both hemispheres.

Dichromena globosa (HBK.) R. & S. Syst. 2: 90. 1817. *Schoenus globosus* HBK. Nov. Gen. & Sp. 1: 229. 1816.

Similar to *D. ciliata*, but apparently distinct; leaves equaling or longer than the culms; spikelets 5 mm. long, numerous and densely congested in a very compact head; scales acute.

Huánuco: Casapí (*Poeppig*). Ranging to Central America and Cuba, usually in grasslands.

Dichromena Killipii (Gross) Macbr., comb. nov. *Rynchospora Killipii* Gross, Field Mus. Bot. 11: 40. 1931.

More than 1 meter high, with smooth culms and sheaths, the latter deeply incurved at the throat; leaves (upper) about 7 dm. long, 12–14 mm. wide, long-attenuate-acuminate, sharply scabrous on the edges; inflorescence shortly pilose-hirsutulous, strict, about 2 dm. long and less than half as wide, interrupted; lowest bracts 3, leaf-like, ciliate, the bracts proper inconspicuous; principal branches of the inflorescence somewhat spreading, about 4 cm. long; spikelets nearly sessile, crowded, conic lanceolate, the elliptic mucronate scales about 17, the upper 10 empty and narrower; bristles 5, equal, slightly scabrous; achene unknown.—A plant of dense forest.

Junín: Yapas, Pichis Trail, 1,350–1,600 meters, *Killip & Smith 25566*, type.

Dichromena Kuntzei (Clarke) Macbr. Field Mus. Bot. 11: 42. 1931. *Rynchospora Kuntzei* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 39. 1908. *R. Kukenthalii* Pfeiff. Repert. Sp. Nov. 17: 237. 1921. *R. Uleana* Kükenth. Bot. Jahrb. 56: Beibl. 125: 17. 1921, non Boeckl. 1896. *D. Kukenthalii* Macbr. Field Mus. Bot. 4: 167. 1929.

About 4 dm. high, from a short rhizome; leaves about as long as the striate culms; leaves glabrous, plane, 12–18 mm. wide; corymbs 5, distant and long peduncled, very lax, with a few divaricate scabrous branches; spikelets rather few, 6–8 mm. long, 3 mm. broad; scales pale, ovate, rounded or emarginate, mucronate, the upper fertile ones narrower and acute; achene as long, truncate, quadrate-reticulate, equaled by the narrowly conic, pale, persistent beak; bristles 6, scabrous, little longer than the achene.—This species simulates the group *Pleurostachys*. Gross has referred the type collection of *R. Uleana* in Herb. Dahlem to Kuntze's species, apparently rightly. Neg. 11143.

Río Acre: *Ule 9148*. Bolivia.

Dichromena Lechleri (Steud.) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora Lechleri* Steud. ex Boeckl. Linnaea 37: 633. 1873.

Culms very slender, somewhat nodding, rigid, triangular, several dm. high; leaves less than 2 mm. wide, serrulate-scabrous as also the truncate sheaths; panicles about 4, only 1–2.5 cm. long, long-peduncled, the branchlets few; spikelets usually solitary, oblong-lanceolate, 5–6 mm. long; scales mucronulate; achene reticulate, the elongate-conic subscabrous beak a little longer, its dilated base emarginate or slightly bilobate; bristles rigid, hispid, exceeding the achene. Neg. 12152.

Puno: Tatanara, *Lechler 2525*.

Dichromena locuples (Clarke) Macbr. Field Mus. Bot. 8: 114. 1930. *Rynchospora locuples* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 38. 1908.

About 1 meter high; leaves 12–17 mm. broad; panicle dense, 4 dm. long, 12 cm. wide, its paniculate clusters rigid, pyramidal; spikelets 3–4 mm. long, lanceolate, bright straw-color, with 1 achene; achene pale, reticulate, oblong-ellipsoid, 1–1.5 mm. long, exceeded by the oblong-linear rugulose white beak; bristles scabrous, irregular, sometimes 1 or 2 of them longer than the achene.

Huánuco: Muña, *4109* (det. Gross). Ranging north to Costa Rica.

Dichromena macrochaeta (Steud.) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora macrochaeta* Steud. ex Boeckl. Linnaea 37: 632. 1873.

Culms about 1 meter high, obtusely angled, many-leaved; leaves carinate, scabrous-margined, 5–7 mm. broad; panicles 3–4, fasciculate, contracted, the upper 2 approximate, the terminal one about 3 cm. long and nearly as wide; spikelets linear-oblong, 6–8 mm. long; scales thin, oblong, carinate, brown; achene very lustrous, nearly smooth, the 4 bristles a little shorter.—The terminal spikelet is usually staminate. Neg. 12154.

Junín: Huacapistana region, 3,000–3,500 meters, *Weberbauer 2255* (det. Clarke); 254.—Huánuco: Near Huánuco, *2177* (det. Gross). Mito, *1444* (det. Gross). Between the Marañón and Monzón, 3,000–3,700 meters, *Weberbauer 3718* (det. Clarke); 254.—Puno: Agapata, *Lechler 1819*.—Cuzco: Pillahuata, *Pennell 13945* (det. Gross).—Amazonas: Chachapoyas, *Williams 7590* (det. Gross). Ranging northward to Costa Rica.

Dichromena Mandonii (Clarke) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora Mandonii* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 38. 1908.

Near *D. polyphylla*, but more pubescent; spikelets more numerous and only 4–5 mm. long.—Grass-like in appearance from the many and crowded spikelets. Neg. 11144.

Junín: La Merced, *5423; Schunke 246*. Bolivia.

Dichromena Pearcei (Clarke) Macbr. Field Mus. Bot. 11: 6. 1931. *Pleurostachys Pearcei* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 41. 1908.

Culms 1–2 meters high, very leafy above; leaves linear, 4 dm. long and 6–9 mm. broad, rigid, long-attenuate at apex, minutely scabrous on the margins; corymbs many, large, disposed in a panicle 6 dm. long and about 1 dm. broad, the divaricate branches 3–6 cm. long; spikelets 1–2 mm. long, in small heads at the tips of the branchlets, pale brown; achene scarcely 1 mm. long, turgid, smooth, with a smooth pale beak about three-quarters as long.

Tumbes (?): Monterico, 1,000 meters (*Pearce*).

Dichromena peruviana (Clarke) Macbr. Field Mus. Bot. 11: 6. 1931. *Pleurostachys peruviana* Clarke, Kew Bull. Misc. Inf. Add. Ser. 8: 42. 1908.

Plants about 1 meter high, with lanceolate leaves 2 dm. long and 4 cm. broad; corymbs small, divaricately branched; spikelets in small heads, 1 mm. long.—Imperfectly known.

Puno: Sangabán (*Lechler 2425*).

Dichromena polyphylla (Vahl) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora polyphylla* Vahl, Enum. 2: 230. 1806. *Schoenus polyphyllus* Vahl, Eclog. Amer. 2: 5. 1798.

Slender, to 6 dm. high, with many nodes; leaves often equaling the culm, 4 mm. wide, sometimes pilose; panicle 3–4 dm. long, with slender branches bearing the axillary corymbs; spikelets small, pale, the scales ovate-lanceolate; bristles nearly obsolete; achene obovoid-globose, coarsely reticulate, with a green beak half as long. —Well marked by its slender-branched inflorescence of pale spikelets in small clusters.

Junín: Between Huacapistana and Palca, 2,700–3,000 meters, *Weberbauer 2142;* 247. Above San Ramón, *Schunke A73* (det. Gross).—Huánuco: Muña, dry rocky woods, 3,000 meters, *4037.*—Cuzco: Prov. Convención, *Weberbauer 5040.*—Also in the montaña (Weberbauer, 281). Ranging to Central America.

Dichromena radicans S. & C. Linnaea 6: 28. 1831.

Similar to *D. ciliata,* but the leaves sometimes narrower, the involucral bracts 2–5 and usually green throughout, and the cinnamon-brown spikelets 1–5 and digitate.—The weak culm is often proliferous at the apex and decumbent.—Illustrated, Field Mus. Bot. 3: 79 (fruit).

Junín: Chanchamayo Valley, *Schunke 253.* Dos de Mayo, 1,800 meters, *Killip & Smith 25874.*—Ayacucho: Near Kimpitiriki, 400 meters, *Killip & Smith 22961.*—Loreto: Yurimaguas, 135 meters, *Killip & Smith 28322.* General in tropical America.

Dichromena Ruiziana (Boeckl.) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora Ruiziana* Boeckl. Linnaea 37: 641. 1873.

Similar to *D. macrochaeta,* but the panicles about 7, and as much as 7 cm. long, ovate-sublanceolate, and much branched.—Clarke has written on a sheet of *Weberbauer 3343:* "This species perhaps does not differ enough from *R. macrochaeta.*" Neg. 152.

Puno: Sandía, *Weberbauer 574* (det. Clarke). Valley of Sandía, *Weberbauer 3343; Ruiz.*—Junín: Palca, 2,700–3,100 meters, *Weberbauer 2458* (det. Clarke); 248.—Huánuco: Between the Marañón

and Monzón, *Weberbauer 3343* (det. Clarke); 254. Mito, 3,000 meters, *1693*.

Dichromena Ruiziana var. **triceps** (Boeckl.) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora triceps* Boeckl. Linnaea 37: 642. 1873. *R. Ruiziana* var. *triceps* Schum. ex Clarke in Urban, Symb. Ant. 2: 115. 1900.

Some of the panicles more or less clearly 3-branched.—Neg. 152.

Huánuco: Mito, *1874; Ruiz.*

Dichromena semiinvolucrata (Presl) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora semiinvolucrata* Presl, Rel. Haenk. 1: 198. 1828.

About 1 meter high, the angled culms scabrous, as also the leaf margins; inflorescence 12 mm. thick, globose; spikelets lanceolate, numerous; scales 1-nerved, glabrous, ovate-lanceolate, mucronate, the lower sterile; bristles 6, barbed, 3 times longer than the ovary; beak compressed, longer than the ovary; style bifid.—Apparently a *Dichromena.*

Huánuco: In the mountains (type locality).

Dichromena umbraticola (Poepp. & Kunth) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora umbraticola* Poepp. & Kunth in Kunth, Enum. Pl. 2: 300. 1837.

Culms glabrous, sulcate; leaves scabrous-margined, lanceolate, 1.5–2 dm. long, 1.5–3.5 cm. broad, many-nerved; panicles simple, axillary and terminal, long-peduncled, with spreading hispidulous-scabrous branches; spikelets to 20-flowered, pedicellate, 6–7 mm. long; scales ovate, mucronate, 1-nerved, light brown; bristles 5, scabrous, twice longer than the ovary; style very long, bifid, the base conic. Neg. 150.

Huánuco (?): Mission of Chalones on the Huallaga (*Poeppig*).—Loreto: Santa Catalina (*Huber 1520*). Puerto Arturo, in forest, *Williams 4966*. Santa Rosa, *Williams 4895*. Yurimaguas, edge of forest, *Williams 4290*.

Dichromena Weberbaueri (Clarke) Macbr. Field Mus. Bot. 4: 167. 1929. *Rynchospora Weberbaueri* Clarke, Bot. Jahrb. 37: 518. 1906.

Glabrous, the culms 3–4 dm. high, sparsely leafy; basal leaves 1–1.5 dm. long, 3–4 mm. broad, firm; panicle narrowly oblong, to 1.5 dm. long and 2–3 cm. broad, interruptedly branched; corymbs

dense, only the terminal approximate; spikelets 6 mm. long, lanceolate, pale brown, with 1–3 achenes; style obscurely 2-toothed; bristles 4, brown, scabrous, exceeding the beaked achene; achene oblong, brown, fenestrate, the beak as long.—In inflorescence like *Psilocarya*. Differs, perhaps, from *R. Ruiziana* in the inflorescence. Curiously enough, the type number in Herb. Dahlem is *D. glauca*, fide Gross.

San Martín: Moyobamba, 1,400 meters, *Weberbauer 4745* (type). —Cajamarca: Above Tabaconas, *Weberbauer 6104* (det. Gross).

13. SCLERIA Berg

Mostly rather coarse sedges with leafy culms, readily recognizable in fruit by the conspicuous, bony, crustaceous, usually white achene. Flowers monoecious; spikelets often androgynous, small, clustered, the fertile only 1-flowered; style 3-cleft, deciduous.—The width of the leaves is somewhat variable, but its use as a key character makes possible the determination of most specimens, even when in flower.

Leaves mostly more than 1 cm. wide (1–5 cm.).

Sheaths conspicuously 2–3-winged.

Leaves 1–1.5 cm. wide.

Sheaths 2-winged.....*S. riparia.*

Sheaths 3-winged.....*S. Poeppigii.*

Leaves 2.5–5 cm. wide.

Auricle short, rigid.

Achene disk serrate.....*S. sylvestris.*

Achene disk merely lobed.....*S. paludosa.*

Auricle conspicuous, soft.....*S. stipularis.*

Sheaths angled or narrowly winged.

Sheaths glabrate or lightly pilose; achene disk undulate or 3-lobed.

Achene disk merely undulate-margined; inflorescence conspicuously bracted.....*S. bracteata.*

Achene disk 3-lobed; inflorescence not conspicuously bracted. *S. melaleuca.*

Sheaths villous-hirsute; disk deeply 3-lobed, the margins thick. *S. peruviana.*

Leaves mostly less than 1 cm. wide (1.5–12 mm.), or the achenes very small.

Sheaths merely angled or margined (narrowly winged).

Clambering plants with 2–4 axillary panicles.

Panicles conspicuously bracted.....*S. bracteata.*

Panicles not or inconspicuously bracted.

Leaves noticeably pubescent; achenes smooth....*S. secans.*

Leaves obscurely pubescent; achenes tuberculate below or lineately pubescent.

Scales ovate; achenes pubescent.....*S. Macbrideana.*

Scales lanceolate; achenes tuberculate.....*S. Williamsii.*

Erect plants with terminal panicles or spikes, or the achenes only 1 mm. wide.

Achenes with a disk at base; spikelets glabrate or not densely ciliate-hairy.

Plants rather stout, with many flowers, glabrous or leaves scabrous-ciliate or pilose; achene stipitate or sessile.

Plants not pilose; achenes tiny or the inflorescence elongate.

Achenes small or very small.

Achenes tiny, sessile, the disk cupulate.*S. microcarpa.*

Achenes not tiny, stipitate, the stipe cupulate at apex.....*S. spicata.*

Achenes medium-sized (3–4 mm. long).

Achenes conspicuously exserted, purple; scales ovate. *S. Macbrideana.*

Achenes included but visible, white; scales lanceolate. *S. Williamsii.*

Plants more or less pilose; achene disk somewhat spreading or reflexed; inflorescence ovate.....*S. reflexa.*

Plants asperous or smooth, slender, few-flowered; achene sessile, the disk lobed.....*S. lagoensis.*

Achenes merely trigonous at base; usually a pubescent plant with ciliate-hairy spikelets.....*S. hirtella.*

Sheaths definitely 3-winged.

Staminate spikelets narrow or linear; auricle more or less conspicuous.

Auricle soft, papery-hyaline.....*S. stipularis.*

Auricle firm, nerved.....*S. vaginata.*

Staminate spikelets lanceolate; auricle small.....*S. Poeppigii.*

Scleria bracteata Cav. Icon. 5: 34. *pl. 457.* 1799.

Robust, often pilose, from a fleshy rhizome; culms 3-angled, to 10 dm. high, the shorter caudate leaves with scarcely winged sheaths, 12 mm. broad; ligule ovate; upper panicles dense, male, the lower much more open, female and conspicuously bracted; achene globose, rough and pilose, the reddish disk merely undulate, entire.

Huánuco: Cochero (*Poeppig*). Pozuzo, *4566.*—San Martín: San Roque, *Williams 7115.* Tarapoto, *Williams 6679.* Brazil to Mexico and the West Indies. "Tiririca," "cortadera."

Scleria hirtella Sw. Prodr. 19. 1788.

Culms slender, glabrous, 1 to several dm. high; leaves grass-like, often densely pubescent, especially below, 1.5–4 mm. wide; inflorescence spike-like, the sessile spikelets in a number of remote fascicles, ciliate-hispid with lustrous or reddish hairs; achene globose, white, lustrous, smooth, but with 9–12 pores near the base.—*S. lithosperma* (L.) Sw. is similar, but the inflorescence is loosely paniculate and glabrous.

San Martín: Moyobamba, *Weberbauer 4678* (det. Clarke).—Without locality, *Poeppig 958; Pavón.* Widely dispersed in tropical America.

Scleria lagoensis Boeckl. Kjøb. Vid. Medd. 151. 1869. *S. Moritziana* Boeckl. Linnaea 38: 460. 1874.

Culms deeply sulcate-angled; sheaths narrowly margined; leaves 3–6 mm. wide, puncticulate-asperulous; spike terminal, rather loosely branched, about 4 cm. long; male spikelets linear-oblong, 5 mm. long; scales lanceolate, acute; achene reticulate and sparsely pubescent, the 3-lobed yellowish disk not serrate.—*S. pterota* Presl has broader leaves, panicles 5–15 cm. long, and a smooth achene.

Loreto: Cerro de Canchahuayo (*Huber 1482*). Brazil; Venezuela.

Scleria Macbrideana Gross, Field Mus. Bot. 11: 40. 1931.

In general similar to *S. Williamsii;* culms and leaves lightly scabrous; panicles axillary, laxly divaricate, to nearly 1.5 dm. long, the largest scabrous branches to 3.5 cm. long; spikelets pedicellate, elliptic, 5 mm. long, 3 mm. broad; scales about 9, ovate, reddish, the keel extended; achene conspicuously exserted, broadly conic, 3 mm. long, 2 mm. wide, deep violet, or white only at base, marked with cross lines of minute hairs; disk fleshy-coriaceous, 3-lobed, undulate, yellowish red.

Loreto: La Victoria, *Williams 2571,* type.

Scleria Martii (Nees) Steud. Syn. Cyp. 171. 1855. *Hymenolytrum Martii* Nees in Mart. Fl. Bras. 2, pt. 1: 176. 1842.

Glabrous or nearly so but scabrous on the culm angles and leaves; sheaths lustrous, angled, with a conspicuous rounded membranous ligule; leaves rigid, several dm. long, 8–12 mm. wide, 5-nerved; panicle terminal, ovate, densely branched, the male peduncles widely spreading; spikelets purple, the female single or geminate, sessile in the axils of the branchlets, the male ternate, pedicellate; achene subglobose-trigonous, white, minutely pilose, the narrow white-margined disk undulately 3-lobed.—Illustrated, Mart. Fl. Bras. 2, pt. 1: *pl. 22.* "Cortadera."

Loreto: Río Nanay, *Williams 736* (det. Gross). Brazil.

Scleria melaleuca Schlecht. & Cham. Linnaea 6: 29. 1831.

Nearly glabrous below, especially the narrowly winged sheaths, but the ovate ligule pilose; culms triangular, 3–8 dm. tall, the shorter leaves 1 cm. broad; inflorescence 1–3 dm. long and 4–6 cm. wide, with 1–4 axillary rigid reddish panicles of male and female spikelets mixed; spikelets 5 mm. long; achene disk 3-lobed, reddish-margined; achene ovoid, lustrous. Neg. 11207.

Huánuco: Pozuzo, 600 meters, *4547.*—Junín: Puerto Bermúdez, 375 meters, *Killip & Smith 26530.*—Loreto: Lower Río Nanay, *Williams 363.* Río Itaya, *Williams 39.* Pebas, *Williams 1733.* Yurimaguas, *Williams 3939.* Iquitos, *Killip & Smith 27219.* Santa Rosa, *Williams 4799.*—San Martín: Tarapoto, *Williams 5597.* Generally distributed in tropical America. "Cortadera."

Scleria microcarpa Nees, Linnaea 9: 302. 1834.

Culms and leaves slender and smooth, sometimes 1 meter high, the leaves 6–12 mm. broad; sheaths narrowly winged; ligule 4–8 mm. long; panicles slender, spike-like, loosely flowered; spikelets usually in 2's or 3's; achene white, smooth, 1–1.5 mm. long. Neg. 11209.

Loreto: *Poeppig.* Río Itaya, *Williams 3297, 3224; Killip & Smith 29385.* La Victoria and Iquitos, *Williams 2640, 1505* (all det. Gross). South America and the West Indies. "Cortadera."

Scleria paludosa Poepp. & Kunth in Kunth, Enum. Pl. 2: 344. 1837.

Robust and 1 meter tall or taller, at least the erect, rigid and dense inflorescence glabrate; leaves 2–4 dm. long, often 3 cm. wide, the sheath winged, with a short rigid ligule; spikelets 4 mm. long;

achene 5–6 mm. long, the lightly 3-lobed, more or less ridged disk shortly rusty-ciliate.

San Martín: Near Tocache (*Poeppig*). Brazil to Guatemala and Cuba.

Scleria peruviana Kükenth. Bot. Jahrb. 56: Beibl. 125: 22. 1921.

Culms 5–7.5 dm. high, remotely leafy, somewhat densely hirsute; leaves shorter, 1.5–2.5 cm. wide, deep green, rigid, prominently 3-nerved, puberulent or glabrate; sheaths long-hirsute, scarcely winged, the scabrous throat shortly produced; panicles very lax, the larger pyramidal terminal ones 1 dm. long and broad, with divergent flexuous hispidulous branchlets and setaceous bractlets; male spikelets peduncled, 6–7 mm. long, the female subsessile, 5 mm. long; scales straw-green, with brown edges, strongly carinate, aristate, hispidulous; achene a little shorter, 4.5 mm. long, white, lustrous, cross-undulate and slightly hispid; disk cup-like, deeply 3-lobed, the lobes purplish, with thickened straw-colored margins.

Río Acre: *Ule 9150*, type.—Junín: Río Pichis, *Killip & Smith 26749* (det. Gross).

Scleria Poeppigii (Nees) Steud. Syn. Pl. Cyp. 171. 1855. *Hymenolytrum Poeppigii* Nees in Mart. Fl. Bras. 2, pt. 1: 175. 1842.

Culms and leaves (to 1 cm. wide) scabrous; sheaths 3-winged; panicles axillary and terminal, pyramidal, the branchlets widely divaricate; spikelets lanceolate, 4 mm. long, the male on pedicels as long; fruit unknown.—*S. mitis* Berg. might be sought here. It has smooth culms and the achene disk is reddish-setose.

San Martín: Tocache (*Poeppig*).—Loreto: Prov. Mainas (*Poeppig*). Brazil.

Scleria reflexa HBK. Nov. Gen. & Sp. 1: 232. 1816.

Culms angled scabrous; sheaths and leaves somewhat pilose as also the slender panicle branches; leaves about 8 mm. wide; ligule scarious; achene 3 mm. thick, the subentire disk with a thin, spreading or reflexed margin.

San Martín: Tarapoto, *Williams 6381, 5632; 5614* (det. Gross).—Loreto: Yurimaguas, *Killip & Smith* (det. Gross).—Junín: Chanchamayo Valley, *Killip & Smith* (det. Gross). South America to Mexico. "Siesi," "cortadera."

Scleria riparia Poepp. & Kunth in Kunth, Enum. Pl. 2: 341. 1837.

Culms tall, acutely angled, glabrous as also the 2-winged sheaths; leaves scabrous on the margins, 3-nerved, 10–16 mm. broad; inflores-

cence narrow, elongate, the lower axillary panicles raceme-like, the upper branched; spikelets male or female, the former oblong, many-flowered, the latter 1-flowered; scales glabrous, ovate, brown, reddish-lineolate, acute or mucronate; achene smooth, yellowish white, beaked by the blackish style base, the cupulate disk sinuously 3-lobed and densely brown-setulose. Neg. 11215.

San Martín: Tocache (*Poeppig*). Brazil.

Scleria secans (L.) Urban, Symb. Ant. 2: 169. 1900. *S. flagellum* Sw. Prodr. 18. 1788. *S. reflexa* HBK. Nov. Gen. & Sp. 1: 232. 1816.

Scabrous, puberulent, often very harsh, usually several meters long, particularly when supported in other vegetation; leaves about 2 dm. long and 3–8 mm. wide, the sheaths not winged, the ligule scarious-lacerate; panicles 2 or 3, axillary in the upper leaves on slender stalks, the rachis scabrous-villous; achene smooth, usually white, lustrous, 3–4 mm. long, with a purplish orbicular disk.

Loreto: Yurimaguas (*Poeppig*). Caballo-cocha, *Williams 2168* (det. Gross). Ucayali, *Tessmann 3277*. Timbuchi, *Williams 1011*. —Montaña zone (Weberbauer). Brazil to Mexico and West Indies. "Cortadera."

Scleria spicata (Spreng.) Macbr. Field Mus. Bot. 4: 168. 1929. *Rynchospora spicata* Spreng. Syst. Veg. 1: 194. 1825. *S. pleostachya* Kunth, Enum. Pl. 2: 355. 1837.

Glabrous except for the somewhat ciliate keel and the margins of the rigid linear leaves; auricle ovate, obtuse; panicle terminal, simple or with few remote elongate spike-like branches, the lower geminate, the upper solitary; spikelets sessile, remote, small; achene obovate, stipitate, the stipe cupulate-dilated at apex. Neg. 11212.

Puno: Sandía Valley, 2,000–3,000 meters, *Weberbauer 665* (det. Clarke); 238.—Cuzco: Río Pillahuata, *Pennell 13943*. Brazil.

Scleria stipularis Nees in Hook. Journ. Bot. 2: 394. 1840.

Culms angled, little if at all scabrous, the sheaths 3-winged, with a conspicuous scarious auricle; leaves rigid, 6–8 mm. broad (sometimes 2–3 cm.?), scabrous; panicle compound, terminal, closely branched; male spikelets linear, pedicellate; scales reddish; achene subglobose, lustrous, pubescent; disk 3-lobed, the lobes smooth.

Huánuco: Monzón, *Weberbauer 3621* (det. Clarke).—Loreto: Upper Río Nanay, *Williams 1224* (det. Gross). Guiana. "Atunzichic."

Scleria sylvestris Poepp. & Kunth in Kunth, Enum. Pl. 2: 346. 1837. *S. arundinacea* Kunth, apparently, at least as to Peru.

Culms angled, retrorsely scabrous and punctately pubescent, leafy: leaves and 3-winged sheaths scabrous, the former to 4 cm. broad; inflorescence often 4 dm. long and more or less purplish; panicle branches spreading, angled, scabrous; bracts elongate, subulate; achene disk 3-lobed, the often colored lobes irregularly serrate with rigid narrow teeth.

Huánuco: Cochero (*Poeppig*).—Junín: Hacienda Schunke, La Merced, 4,000 meters, *5794* (var., det. Gross); *Schunke 247*.—San Martín: San Roque and Tarapoto, *Williams 7431, 6613* (det. Gross). Moyobamba, *Weberbauer 4760*.

Scleria vaginata Steud. Syn. Cyp. 179. 1855.

Stout, scabrous on the angles, with long 3-winged sheaths; ligule none; leaves sometimes 6 dm. long or longer, 6 mm. broad, scabrous beneath and on margins; panicles axillary, much branched; female spikelets few; fruiting scales broadly ovate, the back green, the thin margins brown, acuminate; achene smooth, ovate, the narrow disk entire or scarcely undulate-denticulate.

Loreto: Yurimaguas, *Williams 4526, 4843*.—Junín: Above La Merced, *Schunke A74*. (All det. Gross). Brazil. "Cortadera."

Scleria Williamsii Gross, Field Mus. Bot. 11: 39. 1931.

Slender, possibly supported, the principal inflorescences terminal and axillary but also accompanied by much smaller ones from the same node; leaves 2.5–3 dm. long, 6 mm. wide, less pubescent than the narrow sheaths; panicles open, the larger to 11 cm. long, with 3–7 divaricate branches, the largest about 4 cm. long, bracteate, puberulent; spikelets sometimes long-pedicellate, 6 mm. long; scales 4–6, distichous, ovate-lanceolate-acuminate, carinate, nearly glabrous, greenish with reddish margins, exceeding the globose-trigonous achene, this 4 mm. long, white, lustrous, minutely verruculose and pilose below, the conical beak more or less strongly recurved; disk pale brown, 3-lobed, the margin involute.

San Martín: Alto Río Huallaga, *Williams 5823*, type.

14. BECQUERELIA Brongn.

Calyptrocarya Nees.

Similar to *Scleria* with which, following Clarke, it could be merged. Spikelets monoecious, tiny, in small fascicles, the apparently terminal

one 1-flowered, pistillate. Fascicles of spikelets cymose or corymbose-paniculate, sometimes crowded into small heads. Nutlets often subglobose, 1.25 mm. or less broad.—"Arenaria."

Scales narrowly ovate-acuminate; achenes depressed-globose, glabrous.....*B. Merkeliana.*

Scales ovate, barely acute; achenes ovate, puberulent.

Cymes simple or nearly so.....*B. glomerulata.*

Cymes compound.....*B. bicolor.*

Becquerelia bicolor (Nees) Pfeiff. Repert. Sp. Nov. 18: 381. 1922. *Calyptrocarya bicolor* Nees, Linnaea 9: 304. 1834. *C. Poeppigiana* Kunth, Enum. Pl. 2: 364. 1837; in Mart. Fl. Bras. 2, pt. 1: 194. *pl. 28.* 1842.

Loreto: Near Yurimaguas, *Poeppig.* Río Huallaga, *Williams 4378* (det. Gross). La Victoria, *Williams 2979.* San Ramón, *Williams 4559.* Fortaleza, *Williams 4247.* Brazil and British Guiana.

Becquerelia glomerulata Brongn. in Duperrey, Bot. Voy. Coq. 163. 1829. *Calyptrocarya fragifera* Kunth, Enum. Pl. 2: 364. 1837. *C. angustifolia* Nees, Linnaea 9: 304. 1834, nomen.

Leaves 4–6 mm. broad. Neg. 11185.

Río Acre: *Ule 9149.* Bolivia and Brazil to Tobago and Central America.

Becquerelia Merkeliana Nees in Mart. Fl. Bras. 2, pt. 1: 191. *pl. 27.* 1842.

Slender and tall, with beautifully striate, oblong leaves 1–2 cm. wide, scabrous on the margins; spikelets capitately congested in much-divided cymes; scales acuminate; achene lightly tuberculate, lustrous, with a fold around the base, much resembling a young acorn.

Loreto: Iquitos, *Killip & Smith 26976* (det. Gross). Brazil.

15. UNCINIA Pers.

Leafy plants with slender or long, club-shaped spikes, the long-exserted rachilla with a very abruptly recurved tip in the Peruvian species, forming a hook.—A convenient genus, easily recognized, but technically, through one or two species, too near *Carex.*

Uncinia hamata (Sw.) Urban, Symb. Ant. 2: 169. 1900. *Carex hamata* Sw. Prodr. 18. 1788.

Spike cylindrical; achene obovate-oblong.

Huánuco: Huacachi, 2,100 meters, *4149*.—Junín: Chanchamayo Valley, *Schunke 254*. Above San Ramón, *Schunke A76*.—Cuzco: Valley of San Miguel, *Herrera 2022*. General in the mountains of tropical America.

Uncinia phleoides (Cav.) Pers. Syn. 2: 534. 1807. *Carex phleoides* Cav. Icon. 5: 40. *pl. 464*. 1799.

Spike clavate; achene narrowly oblong.

Huánuco: Mito, 3,000 m., *3351* (det. Mackenzie). Colombia to Patagonia.

16. CAREX L.

(Determinations mostly by Kenneth K. Mackenzie)

Reference: Kükenthal, Pflanzenr. IV. 20. 1909.

Grass-like sedges, generally characterized by triangular culms, 3-ranked leaves, and spike-like or head-like inflorescences. Flowers unisexual, borne in the axils of scale-like bracts, the achene enclosed in a sac or perigynium.—The references to *C. Hoodii* Boott by Weberbauer, 183, 185, 186, probably are based on a misdetermination. Possibly the plants are *C. praegracilis* Boott.

Inflorescence a solitary spikelet (head).....*C. setifolia*.

Spikelets several to many.

Spikelets sessile and staminate and pistillate (in *C. cladostachys* paniculate and the lower panicles pedunculate).

Spikelets spicate or more or less congested.

Culms smooth, often less than 1.5 dm. high.

Culms little exceeding the leaves; perigynium 2.5 mm. long, nerved.....*C. ecuadorica*.

Culms well exceeding the leaves; perigynium 4 mm. long, scarcely nerved.....*C. Mandoniana*.

Culms scabrous, at least above, usually tall.

Leaves plane, 2–3 mm. wide; perigynium nerved.

Perigynium 4–4.5 mm. long, the margin erose-dentate. *C. Macloviana*.

Perigynium 3–3.5 mm. long, scabrous-margined. *C. Bonplandii*.

Leaves convolute, filiform; perigynium nerveless. *C. praegracilis*.

Spikelets panicled.....*C. cladostachys*.

Spikelets peduncled (usually), and some at least always wholly staminate or pistillate.

Spikelets sessile or apparently so.
Depressed alpine plants, rarely 3 cm. high.
Green-carinate scales equaling the 2-nerved perigynium. *C. hypsipedos.*
Trinerved scales shorter than the carinate perigynium. *C. brachycalama.*
Tall plants..... *C. crinalis.*
Spikelets peduncled, at least the lowest or the pistillate.
Spikelets many and short (1–3 cm.) or, if longer (3–5 cm.), very numerous (20–30).
Stigmas 2; inflorescence paniculate.
Scales nearly black, with a green keel. *C. pichinchensis.*
Scales reddish or pale on the back..... *C. fecunda.*
Stigmas 3; inflorescence spicate.
Culms smooth, the shorter leaves plane..... *C. hebetata.*
Culms scabrous, the subequal leaves bicarinate. *C. Jamesonii.*
Spikelets few (about 4–8) and often several cm. (3–9) long.
Leaves never septate-nodose.
Leaves 2–3 mm. wide..... *C. brachycalama.*
Leaves 5–10 mm. wide.
Rhizome cespitose; pistillate scales greenish. *C. pseudocyperus.*
Rhizome stoloniferous; pistillate scales purple, with a yellowish keel..... *C. acutata.*
Leaves septate-nodose..... *C. Beecheyana.*

Carex acutata Boott, Trans. Linn. Soc. 20: 124. 1846; 700.

Vigorous, sometimes 1.5 meters high, the stout culms scabrous above and equaled or exceeded by the flat leaves; 1–3 upper spikelets staminate, 2–4 cm. long, fastigiate and subsessile, the remaining pistillate (often staminate at apex) 3–9 cm. long, the lower remote and peduncled; fertile scales acute-aristate; perigynium 4 mm. long, densely puncticulate, lustrous, many-nerved, shortly stipitate, the beak broadish, rigid, bidentate; stigmas 3.—Illustrated, Pflanzenr. IV. 20: 701.

Peru: (*Dombey*, according to Kükenthal). Venezuela to Chile.

Carex Beecheyana Boott ex Desv. in Gay, Hist. Nat. Chile 6: 223. *pl. 73, f. 21.* 1853; 749.

A stout and tall, stoloniferous plant with broad leaves, remarkable because septate, and half a dozen spikelets, the two upper staminate and to 6 cm. long, the lower ones 2.5–4.5 cm. long and 8 mm. thick; female scales lanceolate, aristate, concolorous, equaled by the brownish olive, many-nerved, hirtellous perigynium 6 mm. long that terminates in a deeply forked beak; stigmas 3.

Puno: Sachapata (*Grisebach 3290*). Chile.

Carex Bonplandii Kunth, Enum. Pl. 2: 380. 1837; 232.

Plants 2 to several dm. high, slender; spikelets 4–10, to 1 cm. long, approximate; scales lance-ovate, subacute, chestnut with a green keel and narrow hyaline margins; perigynium longer, plano-convex, pale green, slender-nerved on both sides, rounded at base but stipitate, with a long incurved bidentate beak; stigmas 2.—The Peruvian plant is in part the very slender form, var. *angustifolia* Boott.—Illustrated, Boott, Carex 3: *pl. 367*.

Junín: Tarma (*Weberbauer 2250*, 252).—Amazonas: Chachapoyas, 2,000–2,600 meters (Weberbauer, 264).—Huánuco: Mito, 3,000 meters, *1448*.—Puno: Tatanara (*Lechler 2560*). Sachapata (*Lechler 2603*). Tambo Ventillas (*Weberbauer 4409*, possibly from Amazonas). Colombia to Bolivia.

Carex brachycalama Griseb. Symb. Argent. 315. 1879; 509.

Rhizomes long-stoloniferous; culms 2–3 cm. long, smooth, nearly hidden in the leaves; leaves longer, 2–3 mm. wide, plane, with an acuminate subpungent point; spikelets linear-oblong, 4–5, the terminal staminate, all peduncled; female scales chestnut, with a hyaline margin, the back yellowish, cuspidate-mucronate; perigynium 3 mm. long, densely puncticulate, attenuate at base, the short beak subentire; stigmas 3.

Junín: Chinche, 4,000 meters, *1274*. Argentina.

Carex cladostachya Wahl. Vet. Akad. Handl. Stockh. 24: 149. 1803; 267. *C. polystachya* Sw. ex Wahl. loc. cit.

Glabrous or nearly so, with slender clustered culms 3–8 dm. high; leaves nearly as tall, 3–4 mm. broad; panicle narrow, long, the lower clusters of greenish-brown spikes filiform-stalked; spikes about 1 cm. long, mostly staminate at apex only; scales ovate, the lower awned; perigynium ellipsoid, 3–4 mm. long, smooth but striate-beaked; stigmas 3.—Lindmann retains *polystachya* as a variant. The Peruvian material in part is var. *maxima* Kükenth.,

with leaves 8–9 mm. wide. 218.—Illustrated, Amer. Journ. Sci. IV. 2: *pl. 2* (fls.).

Ayacucho: Aina, 750–1,000 meters, *Killip & Smith 22808.* Carrapa, 1,500 meters, *Killip & Smith 22371.*—Cuzco: Near Chilechile, 2,200 meters, *Weberbauer 7857.* At 1,500 meters, *Weberbauer 5041,* 281.—Huánuco: Río Huallaga Canyon, 1,200 meters, *4259.*—Junín: Colonia Perené, *Killip & Smith 25085.* La Merced, 700 meters, *Killip & Smith 23780, 23513.* Huacapistana, 1,800 meters, *Killip & Smith 24277.* Ranging to Venezuela, the West Indies, and Mexico.

Carex crinalis Boott, Proc. Linn. Soc. 1: 256. 1845; 577. *C. peruviana* Presl, Rel. Haenk. 1: 205. 1828.

Culms usually 2–4 dm. high, scabrous and also somewhat pilose below, like the shorter (2–3 mm. wide) rigid flat leaves; spikelets 3–4, sessile, crowded, 1–1.5 cm. long, the oblong lateral ones pistillate; scales ovate, mucronate, yellowish, with a green keel and hyaline edges; perigynium as long or longer, 3–3.5 mm. long, brownish olive, only the 2 marginal nerves prominent, and with a conic entire beak; stigmas 3.—Illustrated, Boott, Carex 4: *pl. 503.*

Huánuco: Mito, 3,000 meters, *1802.* Colombia and Ecuador.

Carex ecuadorica Kükenth. Bot. Jahrb. 34: Beibl. 78: 7. 1904; 118.

Culms and narrow (about 2 mm. wide) leaves rigid and only about 1 dm. high; spikelets congested in a dense ovate spike 1.5 cm. long; scales lance-ovate, acute, reddish brown, with a green keel and broad hyaline margins; perigynium ovate, only 2.5 mm. long, pale, many-nerved, margined, with a long smooth-margined bidentate beak; stigmas 2. Neg. 13392.

Peru: Frequent (*Weberbauer 394; 2347*); 77.—Cuzco: Environs of Cuzco (*Herrera*). Ecuador.

Carex fecunda Steud. Syn. Cyp. 194. 1855; 405. *C. seditiosa* Steud. in Lechler, Berb. Amer. Austr. 56. 1857.

Often 1 meter high, the strongly keeled, scabrous leaves equaling the culms and 4–8 mm. wide; inflorescence to 3 dm. long, the numerous spikelets cylindric, the lower mostly on slender peduncles of varying length; scales ovate-lanceolate, acuminate-mucronate; perigynium plano-convex, a little shorter, 2.5–3 mm. long, yellowish green with red dots, obsoletely nerved, entire-margined and with a short beak, toothed on the edges and shortly bidentate.—*C. Leman-*

niana Boott of Ecuador has a forked perigynium beak.—Illustrated, Pflanzenr. IV. 20: 406.

Huánuco: Huacachi, near Muña, *4108*.—Cajamarca: Río Yucán, near Hualgayoc, 3,600 meters (Weberbauer, 261); *3996* (toward the variety).—Puno: Tabina (*Lechler*). Bolivia; Argentina.

Carex fecunda var. **atropurpurea** (Boeckl.) Macbr. Field Mus. Bot. 11: 42. 1931. *C. atropurpurea* Boeckl. Linnaea 39: 150. 1875.

Spikes ovate-oblong, congested; scales reddish purple.

Cuzco: Paucartambo Valley, *Herrera 1099*.—Without locality, *Ruiz*.

Carex hebetata Boott, Ill. Carex 4: 172. *pl. 583*. 1867; 407.

Culms very tall, the shorter plane coriaceous leaves to 1 cm. broad; spikelets many, 2–3.5 cm. long and 6–8 mm. broad, nodding, the long peduncles of the lower ones capillary; scales obtusish, lanceolate, purplish; perigynium 3 mm. long, olive, lightly nerved, with a very short, entire beak.

Lima: Obrajillo (type locality).

Carex hypsipedos Clarke, Bot. Jahrb. 37: 518. 1906. *C. umbellata* Schk. var. *depressa* Kükenth. Pflanzenr. IV. 20: 453. 1909.

Resembling *C. brachycalama* in habit, but the rhizomes cespitose or short-stoloniferous; culms minutely scabrous; spikes sessile or nearly so; scales pale, 3–4 mm. long, equaling the perigynium, the latter slightly pubescent and with a long scabrous-margined bidentate beak; stigmas 3.—This species name does not seem to have been accounted for by Kükenthal. The plant differs greatly in appearance from any form of the North American *C. umbellata* Schk. See Field Mus. Bot. 8: 113. 1930. Neg. 141.

Junín: La Oroya, 4,300 meters, *Weberbauer 2617*.

Carex Jamesonii Boott, Proc. Linn. Soc. 1: 258. 1845; 408.

Similar to *C. hebetata*, but the spikelets 3–5 cm. long, only 4–6 mm. thick; perigynium 3–4 mm. long, the marginal nerves prominent, the rather long beak minutely bidentate.—Illustrated, Pflanzenr. IV. 20: 406.

Central and South America.

Carex Jamesonii var. **gracilis** Bailey, Bot. Gaz. 13: 88. 1888. *C. Jamesonii* var. *chordalis* Kükenth. Pflanzenr. IV. 20: 409. 1909.

Leaves narrower; inflorescence looser and more elongate.

Huánuco: Mito, 3,000 meters, *1652*. Colombia to Mexico.

Carex Macloviana D'Urv. Mém. Soc. Linn. Paris 4: 599. 1826; 195.

Cespitose, the culms 1 to several dm. high, scabrous and 3-angled toward the apex, exceeding the rigid leaves, these 2–3 mm. broad; lower sheaths brown; spikelets 4–6, ovate, more or less densely crowded in a bractless head about 1 cm. long; scales ovate, hyaline-margined; perigynium 4–4.5 mm. long, erose-dentate above the middle; stigmas 2.—The Peruvian plant is var. *pseudoleporina* Kükenth., a form with paler distinct spikelets.—Illustrated, Pflanzenr. IV. 20: 194.

Cajamarca: *Raimondi* (det. Kükenthal). The species is widely distributed in temperate regions of both hemispheres.

Carex Mandoniana Boeckl. Allg. Bot. Zeitschr. 2: 174. 1896; 194. *C. pinetorum* Liebm. Vid. Selsk. Skr. Kjøbenh. V. 2: 263. 1851, non Willd.

Differs from *C. Macloviana* especially in its creeping rhizome and very narrowly margined, obsoletely nerved perigynium.—Illustrated, Pflanzenr. IV. 20: 194.

Junín: Río Blanco, *797*. Between Tarma and La Oroya, 4,300 meters (Weberbauer, 223). Palca, 2,600–3,100 meters (Weberbauer, 248). Bolivia to Mexico.

Carex pichinchensis HBK. Nov. Gen. & Sp. 1: 233. 1816; 403. *C. Ruiziana* Boeckl. Linnaea 40: 377. 1876.

Often much lower than *C. fecunda*, the spikelets oblong, 1–2 cm. long, and the yellowish perigynium becoming purplish, with a short entire-margined beak.—The Peruvian plant in part is the var. *dura* Boott, with fewer nodding spikelets to 3 cm. long and 1–3-nerved, often hispid-mucronate scales.—Illustrated, Pflanzenr. IV. 20: 404.

Huánuco: Mito, 3,000 meters, *1887*.—Junín: Tarma, 3,600 meters (*Weberbauer 2504*); 249. Huacapistana (*Weberbauer 2223, 2234*). Jauja, *Weberbauer 663*.—Cajamarca: Celendín, 3,800 meters (Weberbauer, 272).—Puno: Sachapata and Tabina, *Lechler 2519, 2050*. Colombia to Bolivia.

Carex praegracilis Boott, Bot. Gaz. 9: 87. 1884; 237. *C. marcida* Boott in Hook. Fl. Bor. Amer. 2: 212. *pl. 213*. 1840, non J. F. Gmel.

Culms slender, 6 dm. high; spikelets 3–4, contiguous in a head 1 cm. long; scales ovate; perigynium brown, edges scabrous toward the deeply bifid beak; stigmas 2.—Illustrated, Amer. Plants 3: *pl. 35*.

Junín: La Oroya, 4,000 meters, *959*. North to Canada.

Carex pseudocyperus L. Sp. Pl. 978. 1753; 695.

A coarse plant with leafy scabrous culms and plane, pale green leaves; spikelets 4–6, the terminal staminate ones 3–6 cm. long; leaf-like bracts elongate; scales oblong-ovate, ciliate, shorter than the broad spreading perigynia, these 4–5 mm. long, their beaks deeply bidentate, and a third as long; stigmas 3.—The Peruvian plant is var. *polysticha* (Boeckl.) Kükenth.

Lima: Without data, *Herb. Dahlem* (det. Mattfeld). Patagonia to Central America.

Carex setifolia Kunze ex Kunth, Enum. Pl. 2: 422. 1837; 83.

The only Peruvian species with a solitary spikelet; leaves setaceous-filiform; inflorescences pseudolateral, ovate, or globose in fruit; stigmas 3.—Illustrated, Pflanzenr. IV. 20: 84.

Tacna: (*Woitschach*).

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